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Technology Transfer and Nationalization in Ghana

Stephen Adei

African Studies
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Abstract

In nationalizing foreign companies, developing countries often do not give adequate consideration to technological capacity as a major determinant of successful operation. As a result, nationalized companies are often not provided with adequate technical, material, and institutional resources. The effect is intensified when the company has been dependent on a transnational corporation (TNC) for vital inputs. This study of the nationalized timber industry in Ghana, examines the performance of two companies - a TNC subsidiary and a company owned by a resident expatriate. Neglect of technology issues before, during, and after nationalization has meant that expected economic gains cannot be realized, particularly in the case of the former TNC subsidiary. The study concludes that nationalization of subsidiaries may not be a viable economic option where technology transfer has not been accomplished and the state fails to discharge its owner responsibilities of providing and refurbishing operating resources.

Résumé

Quand ils nationalisent des compagnies étrangères, les pays en développement, souvent, ne se demandent pas si ces compagnies ont les compétences technologiques nécessaires à leur bon fonctionnement. Il s'ensuit donc fréquemment que les compagnies nationalisées ne reçoivent pas de ressources techniques, matérielles et institutionnelles suffisantes. L'effet de cette insuffisance est d'autant plus grand chez les compagnies qui, auparavant, dépendaient d'une société transnationale (STN) pour leurs ressources essentielles. Cette étude de l'industrie nationalisée du bois d'oeuvre au Ghana porte sur le rendement de deux compagnies - une filiale d'une STN et une compagnie appartenant à un non-ghanéen résidant dans le pays. La négligence des aspects technologiques avant, pendant et après la nationalisation fait que les gains économiques escomptés ne sont pas réalisés. Cela est surtout vrai de l'ancienne filiale d'une STN. L'étude conclut que la nationalisation de filiales n'est peut-être pas un choix économique viable en l'absence de transfert technologique et lorsque l'État se dérobe à ses responsabilités de propriétaire en n'offrant pas les ressources d'exploitation ou en ne les remplaçant pas.

Resumen

Cuando los paises en desarrollo nacionalizan las compañías extranjeras, a menudo sucede que no han dedicado una atención adecuada a la capacidad tecnológica como un factor determinante en la operación exitosa de las compañías. Frecuentemente esto resulta en que las compañías nacionalizadas no han sido provistas de recursos técnicos, materiales o institucionales adecuados. Este resultado se intensifica cuando una compañía ha dependido de una corporación transnacional (CTN) para aportes decisivos. La presente investigación de la industria maderera nacionalizada en la República de Ghana enfoca en la operación de dos compañías - una, la subsidiaria de una CTN y la otra propiedad de un extranjero residente. El descuido de factores tecnológicos antes, durante y después del proceso de nacionalización ha significado que los beneficios económicos esperados no se han logrado, especialmente en el caso de la antigua subsidiaria de la CTN. La conclusión de la presente investigación es que posiblemente la nacionalización de subsidiarias no es una opción económica viable cuando la transferencia de la tecnología no se ha consumado y el Estado no ha cumplido con su responsabilidad de propietario en la provisión y la actualización de recursos necesarios para la operación.

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FOREWORD

This volume is the first in what will become an IDRC occasional series, entitled African Studies in Technology Policy. The launching of the series is an important landmark in the support that IDRC's science, technology, and energy policy (STEP) program has given to development of technology policy studies in Africa over the past 6 years.

In 1981, the STEP program embarked on a series of three African technology policy workshops. Each workshop was a month in length and drew together approximately 24 academicians and policymakers from throughout each region. The participants were exposed to an intensive course in technology policy studies, with special emphasis on the development of research skills. At the end of each workshop, participants were urged to return to their home countries and institutions and submit concrete research proposals for IDRC support. Many did this and eventually received funding from the STEP program. Others did not become involved with research but moved into science and technology policy-making positions in their home governments.

All of the workshops were held in relatively remote locations and participants had ample opportunity to form collegial ties and to discuss common research interests. At the end of the workshop exercise, there was a general desire among some of the most interested participants to meet again, on a regular basis, to share research ideas. Many suffered from marginalization and a certain degree of isolation in their home institutions, where the number of colleagues with an interest in technology policy issues was often quite small. From this demand grew the East African Technology Policy Studies Network and later, the West African Technology Policy Studies Network.

The two networks, which now have a total membership of about 60 active African researchers, have provided financial support for numerous small-scale studies, often case studies, on diverse issues such as technology transfer, training in technological expertise, development of technological capabilities, and the adaptation and diffusion of technologies. Each year, members of the two networks meet in their region and discuss ongoing work, final reports, or proposals that are being submitted for funding. There is also an effort to cross-fertilize, with a few members of each network participating annually in the meeting of the other.

From the networks also have grown National Technology Policy Studies Committees in each country. These committees review proposals for research support and make recommendations to the STEP program. They are a valuable source of methodological guidance for younger, less-experienced researchers. The committees also take on other activities associated with the promotion of science and technology policy studies in their countries.

This study is one of the first to be completed by a member of the West African Technology Policy Studies Network. It presents a careful analysis of the experiences of two firms in the timber sector after the nationalization decree was passed by the Ghanaian government in 1976. The study shows quite clearly that the locally owned and operated firm was much better able to continue with its operations after nationalization than the firm that had been a subsidiary of a transnational corporation. The level of technological capability was much higher in the locally owned firm because it had always tried to hire and train Ghanaians. The study makes a number of important policy recommendations for the consideration of African governments. Most significantly, it points out that a consideration of technological capability should be an important part of the nationalization decision-making process. Nationalization results in state ownership and the state must be prepared to take on the responsibilities of a shareholder, including the provision of capital, the appointment of competent directors and senior officers, and the assurance of accountability.

Eva M. Rathgeber
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When I responded to an advertisement by the International Development Research Centre (IDRC) to attend a technology policy workshop in October 1982 in Monrovia, Liberia, little did I know that my research interest was then going to focus on technology transfer and development of indigenous technological capacity. This study is the direct result of that workshop.

The choice of technological capacity and nationalization as topics for investigation emerged from my observation that the enthusiasm with which developing countries undertake nationalization of foreign firms is often not matched by real economic gains in running the companies, and that lack of technological capacity might be an underlying factor. A timely and generous grant from IDRC made it possible to undertake this study. Without the help of IDRC, this project would not have become a reality.

The project was initially planned as a case study of one company to last for 1 year. It turned out to be a three-firm case study stretching over almost 2 years. This meant that resources had to be stretched thin while the sponsors had to endure the frustration of not seeing concrete results of their benevolence for a longer period. It is hoped that the expansion of the project to reflect a more comprehensive view will justify the delay.

One can hardly undertake such research without incurring intellectual and material debts to many institutions and individuals. My employer, Ghana Investments Centre, had to cope with the demands of the study in terms of the resources and time the project entailed. The Science Policy Research Unit (SPRU) of the University of Sussex provided an ideal academic atmosphere for a month during the initial stages of the project. Later, the opportunity to discuss the draft report at a seminar at the Unit helped me tremendously. At the local level, the Centre for Development Studies, University of Cape Coast, provided opportunities for interaction with academics.

The management and staff of African Timber and Plywood (Ghana) Limited and Mim Timber Company were helpful to the research team. I want to express my sincere appreciation for their patience in compiling long tables of data and answering questions, and for their hospitality.

Other institutions that deserve special mention are the Ghana Timber Marketing Board, United African Company's International Timber Division, London, African Timber and Plywood (Nigeria) Limited, Bonsa Tyre Company, Dunlop Tyre Company, Avon Tyre Limited, and Michelin

(Nigeria) Tyre Limited. I enjoyed my visit to each of these companies and thank them for their cooperation. The case study of Bonsa Tyre Company is the subject of another report in preparation.

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I started this project with Bernard Marbell and Victoria Gyimah as research assistants and I am grateful to them for their help. M.A. Armah supervised the initial data collection. Delay in completing the project meant that at the crucial final stage of the study, I had no assistants, but I am most grateful to Stephen Osei-Yeboah of Ghana Investments Centre who provided all the help that was needed. Darlene R. Bellamy and Sarah Arthur typed this study.

Finally, I am grateful to my wife and children for their endurance.

SUMMARY

There has been an increase in the rate of forced divestments of direct foreign investments during the past two decades in developing countries for political or economic reasons. Since 1960, the countries of sub-Saharan Africa have undertaken most of these national takeovers of foreign firms. But their experience in running nationalized companies has generally been disappointing.

Evidence of desire to control foreign firms in Ghana dates back to the early 1960s but outright nationalization of major foreign firms is a post-1970 phenomenon.

Nationalization has taken place within the framework of overall poor performance of the economy of Ghana. Since the early 1970s, the economy has experienced negative growth rates, double-digit inflation rates, reaching over 100% in the late 1970s, deteriorating economic infrastructure, balance of payments deficits, bugetary and monetary crises, and a highly overvalued currency.

The predominance of political considerations in the nationalization decision is shown by the neglect of technological issues, such as economic assessment of assets and evaluation of technological capabilities of nationals, and the failure to recognize possible adverse consequences that nationalization may have on technological capacity in the firms.

An assessment of postnationalization performance of two companies, namely African Timber and Plywood (Ghana) Limited (ATP) and Mim Timber Company (MTC), using production levels, capacity utilization, productivity, sales and market shares, profitability, and employment as indicators, shows significant differences in the relative performance of the companies.

Of the two companies, the performance of ATP was worse. The factory has discontinued three of its eight production lines since nationalization; utilization of the factory has dropped to about 10% of its rated capacity; recovery rates (major indices of productivity in wood processing) have deteriorated markedly. By the end of 1983, the company, which had hitherto exported almost all of its output, had dropped out of the export market; total sales in 1983 were a fraction (less than 10% in real terms) of the prenationalization level. Except for one year when a meagre GHC 63 000 net profit was earned, the company has sustained persistent net losses; its total indebtedness stood at GHC 128.6 million at the end of 1984 (50 Ghanaian cedis [GHC] = 1 United States dollar [USD] in December 1984).

Because it was integrated into a multinational system, ATP was only a production centre with a weak organizational structure, while planning and scheduling of production were undertaken from London. The presence of expatriate personnel at the firm restricted the development of indigenous technological capabilities. The impact of nationalization was therefore most severe. The government, on the other hand, has responded to the revealed weaknesses with apathy insofar as providing resources and recruiting personnel are concerned.

MTC, which was not a subsidiary of a transnational corporation (TNC), has been able to maintain its prenationalization performance level. Owned by a British expatriate, resident in Ghana, the company operated an integrated timber complex from Ghana. All the necessary technological resources, i.e., adequate institutional setup, tools and instruments, and manpower, both local and foreign with the requisite technological capabilities, were assembled at the firm. Nationalization, therefore, resulted only in change of ownership, not operating resources.

External factors were found to be secondary in accounting for the relative performance of the companies. Three interrelated factors affecting performance were type of prenationalization foreign ownership; development of technological capacity at the firm level in the form of adequate institutional setup, provision for machine and equipment replacement, supply of inputs such as spare parts and industrial consumables, and development of technological capabilities of nationals within the firm; and postnationalization effort to build technological capacity.

Ghana had, and still has, no effective science and technology policy that ensures the transfer of foreign technologies or the development of indigenous ones. Thus the development of local technological capacity in the firms largely depended on the needs of the foreign owners and their benevolence. Even where a technology transfer agreement was signed when the state had equity interests in the firm, the agreement was not monitored to ensure compliance.

Nationalization itself had immediate adverse effects on ATP's technological capacity: offshore material and technical services rendered by the parent company were cut off; expatriate employees left; and some local specialists departed as a result of their allegiance to the TNC or because the conditions of service deteriorated after nationalization.

The nationalization of TNC subsidiaries creates half-factories that may need recapitalization, redeployment of personnel, engagement of new technical personnel, and reorganization of the company to replace support hitherto provided by the parent company. Failure of the state to discharge these responsibilities means that expected economic gains do not materialize.

Since nationalization, the state has done very little to provide resources and personnel for these industries. As a result, while MTC with its good level of technological capacity continues to perform relatively better, ATP is facing severe operational difficulties. It appears that, not only were technological considerations given minimal attention in the decision to nationalize, but they are still neglected in Ghana's postnationalization history so far as the two firms are concerned.

The need for the government to provide financial resources, in both local and foreign currency, for refurbishing ATP and recruiting technical personnel cannot be overemphasized. Besides the direct financial returns that may be gained, the socioeconomic services provided by the company to the community would justify injection of resources and skilled personnel.

It is clear that nationalization does not automatically guarantee enhanced national economic benefit. This is more evident when the country cannot mobilize requisite technological capacity to run the firms. Consequently, developing countries should consider alternatives to nationalization, such as increased monitoring of activities of TNC subsidiaries to ensure that transfer of technology is undertaken, that transfer pricing and other harmful practices of TNCs are reduced, and that there is effective equity participation by nationals. Even equity participation may not be advantageous in the absence of a science and technology policy to ensure maximum national advantage from the operations of TNCs.

In dealing with foreign companies, there is a need to distinguish among the various forms of foreign ownership because their impact on development of indigenous technological capacity differs. Consideration of technological capacity should be an important part of nationalization decision-making.

Nationalization results in state ownership and the state must be prepared to shoulder all the responsibilities of a shareholder, including provision of capital, appointment of competent directors and senior officers, and ensuring accountability. Nationalization, even by confiscation, does not absolve the state from these responsibilities.

Part I

Background Information

INTRODUCING THE STUDY

1

Following economic development theories of the 1950s, many developing countries resorted to attracting direct foreign investment to provide capital, management, and technical know-how in support of their import-substitution industrialization programs (Chenery 1960; Kuznets 1965: 95-97; Sutcliffe 1971: chapter 3). Based on the experience of advanced countries, developing countries sought to industrialize through establishment of import-substituting industries (Hirschman 1958) even though there was some disagreement with that strategy (Lewis 1955: 275-285). Setting up these industries gave a false sense of technological advancement and economic prosperity (see Killick (1978), chapter 7, "Modernization without growth in Ghana"). It did not take long, however, for these economies to experience crises when, for example, repayment of external loans and servicing of import-dependent industries began to take their toll. Little et al. (1970) have argued that import substitution tends to shift income distribution in favour of urban dwellers, to increase the propensity to import, and to disadvantage agricultural producers who are the producers of exports in many developing countries. These factors combine to create balance-of-payment difficulties.

Since the mid-1960s, many developing countries have expressed disillusionment about the operations of transnational corporations (TNCs). This has led to restrictions on foreign investors and even nationalization of foreign companies (Baklanoff 1975; Adei 1980). The areas of concern include TNCs' domination of, not only the extractive industries such as mining and timber, but also the emerging manufacturing and services sectors; the official and unofficial transfer of profits and dividends; the enclave nature of major foreign operations; the low level of technology transfer; and a sense of continued colonial domination as they remain bound by vital economic ties to their former colonial masters (e.g., British investments account for more than 50% of direct foreign investments in Ghana (OECD 1977)).

Several developing-country governments have been exasperated by research findings on the operations of TNCs that have cast serious doubts on the traditionally assumed contribution of TNCs to host-country economies. The voices of anti-imperialist writers, such as Paul Baran (1957), have of late received support from the adverse findings against TNCs in empirical works of writers such as Griffin (1970, 1971) on the capital contribution of direct foreign investments and their impact on balance of payments of host countries; Lall (1973) on transfer pricing mechanisms employed by multinationals and their effect; and Farrell (1979) on the failure of TNCs to transfer technology voluntarily. The apparent success of state takeover of foreign investments in socialist developing countries, such as Cuba in 1959, and noncommunist nations, such as Mexico in the 1940s, has also contributed in no small measure to the increased rate of forced divestments in developing countries. All these factors have tended to undermine the acceptability of TNCs in developing countries.

In Africa, similar findings have emerged in studies on the operations of multinational corporations. For example, according to Langdon (1975) the operations of multinationals in Kenya have resulted in increasing unemployment and regional inequality, and have had little positive, or even negative, effect on the country's balance of payments. At the same time, the foreign companies have succeeded in transferring the preferences of advanced economies to economically underdeveloped Kenya, thus reinforcing the process of inappropriate technology transfer. Swainson (1980) is equally critical of foreign investments in Kenya. From Tanzania, Rweyemamu (1973: 58) seems to justify the widespread nationalization of foreign firms on the grounds of capitalist industrial development, which at best benefited only a small privileged group of the political leaders themselves, senior civil servants, businessmen, traders, and some of the skilled and semiskilled workers employed by the larger corporations. On the other hand, Adei (1980: 10) notes that one of the disatisfactions of the Government of Ghana with foreign development, especially by resident expatriates from Asia, was the small initial investment it contributes to the economy in foreign exchange. These phenomena have led to forced divestment of foreign investment in many African countries.

There has been an increase in the rate of forced divestment in developing countries during the past two decades (Jodice 1980). In fact, it is the view of Kobrin (1980: 87) that "forced divestment has been used, selectively as a policy instrument" by these countries. Although Latin American countries such as Mexico, Cuba, and Chile accounted for the majority of nationalizations in developing countries before 1965, African countries have been leading since then. For example, Kobrin's study (1980) indicated that of 76 countries that undertook forced divestment over a 17-year period (1960-76), 12 African countries were among the top 16; each of these had undertaken 11 or more forced divestments.

Nationalization in Africa has taken two forms. The first pertains to the takeover of foreign firms in the midst of political revolution as occurred in Algeria, Libya, and communist sub-Saharan countries. A second form is one in which foreign firms have been forced to sell part of or all of their shares in a company to the state or its nationals without such revolutionary context. The nationalization of foreign investments in Ghana before June 1979 was the second type.

Experience of Developing Countries with Nationalization

Experience with nationalization has been mixed. Baklanoff (1975) found that nationalization was associated with decline in production levels in Chile, Cuba, and Mexico. However, in some cases state participation or outright takeover has been used successfully to acquire indigenous technological capabilities (Maxwell 1977; Dahlman 1978). The nationalization of oil production, such as that in Mexico in the 1940s and subsequently in the Arab countries, clearly shows that state ownership can coexist with technological deals with TNCs to maintain efficient production systems.

The experience of sub-Saharan African countries in the 1960s and 1970s has generally been disappointing. For example, early in the 70s, Zaire had to reverse the decision to exclude Belgian shareholders in copper production to save the mines. In Tanzania, it is the view of Loxley and Saul (1975) that, although nationalization gave the government control over a significant part of the industrial sector, decision-making is unplanned and uncoordinated, with the result that the companies remain at the mercy of the foreign technical expert or of the management agreement with the multinational company that formerly owned it. Given the nature of its existing class structure reinforced by the TNCs, Langdon (1975) did not see nationalization and a controlled industrial strategy as options open to Kenya. Besides the social situation, it seems that the technological capacity of a country and the arrangement to make good any deficiency that may exist are crucial factors in the success or failure of nationalization policies.

Nationalization in Ghana

The history of nationalization in Ghana has been summarized by Adei (1984) and is reproduced here with minor changes. Nationalization in Ghana has followed changes in political regimes in an unpredictable manner; pro-Western, capitalist-oriented regimes have, for example, nationalized foreign investments.

Even though the socialist rhetoric of Dr Kwame Nkrumah (1957-66) and his Convention Peoples Party, which ushered Ghana to independence, aimed at freeing the Ghanaian economy from colonial or alien control, Nkrumah, more than any other leader, entered into joint ventures in industries ranging from textiles to soap making. Our review in 1983 of joint ventures between the state and foreign investors indicated that 75% began during this period. Fiscal and other incentives to attract foreign investment culminated in the promulgation of the Capital Investment Act in 1963.

In the second half of Nkrumah's rule two foreign trading firms were acquired to form the nucleus of Ghana National Trading Company (GNTC), but our investigations reveal that it was purely a commercial transaction with owners who were willing to dispose of their assets. Marginal gold mining enterprises were similarly acquired when expatriate owners decided to close down their operations for economic reasons.

The general attitude of Nkrumah's regime toward direct foreign investment was to set up rival and competitive state-owned institutions rather than expropriate. The period was considered a transition toward socialism.

Of course this did not preclude what Seymour (1956) termed "creeping expropriation" whereby the share of gains of foreign investors is increased in favour of the host economy. For example, between 1960 and 1965, the corporate income tax on repatriated profits rose from 42.5 to 65-70% compared to 50% for unrepatriated income. Moreover, for a period of nearly 2 years, foreign operations were required to reinvest up to 60% of their after-tax profit in Ghana (Adei 1980: 7).

With the overthrow of Nkrumah in 1966, the new military regime took over the assets of some foreign firms, notably companies owned by one Italian businessman, Drevicci, for alleged corruption and political involvement in the previous regime. This step could not be construed as a general policy of nationalization because the general thrust of the regime was to divest state interests in commercial and industrial ventures to ensure efficiency, a policy that Sawyer (1977) is most critical of. To him, not only is the relative inefficiency of state-owned corporations unacceptable, but it seems the state-owned companies that were sold "for a song" were the relatively viable ones while heavy loss incurring state ventures were kept.

Under a Ghanaian Enterprises Decree in 1968, all small-scale retail and wholesale trade with turnover of less than GHC 500,000 and GHC 1,000,000, respectively, were reserved for Ghanaians. Industries that employed fewer than 30 persons and used "unsophisticated production techniques" as well as manufacturer's representation were also to be reserved for Ghanaians within 5 years. This policy may be termed indigenization rather than nationalization or state control because Ghanaian citizens were the beneficiaries, not the state directly.

The short-lived civilian administration of Dr Busia (October 1969 to January 1972) which succeeded the military regime, despite a declared policy of liberalizing the economy and promoting private capitalist economy based on competition, enacted the Ghanaian Business (Promotion) Act in 1970. Under it, overseas agency representation, hire-purchase business, the sale of vehicles for taxis and the operation of taxi services, hawking and selling in kiosks, and retail and wholesale trading with turnover less than GHC 500,000 were indigenized along with some simple manufacturing processes and services.

The overthrow of the Busia administration in January 1972 coincided with a period of strong nationalist sentiment which was expressed predominantly in three areas. The first was the repudiation of some external debts, a student-supported yentua (we won't pay) move. The second was an Operation Feed Yourself and Industry program aimed at food self-sufficiency for Ghana and the production of industrial raw materials to feed the nation's import-dependent industries. The third, and most relevant to this study, was compulsory state participation in four leading timber companies, owned by TNCs, and all mining ventures (Ghana 1972a, b). The object of the policy was to control the "commanding heights of the economy."

The policy of national participation in foreign business was extended to all foreign-owned companies under an Investment Policy Decree in 1975 which required foreigners to sell 40-60% of their assets to Ghanaians (Ghana 1975). The only exceptions were bauxite processing and oil prospecting where national equity participation was fixed at 30 and 20%, respectively. The Volta Aluminum Company, a giant American aluminum smelter, was not affected.

The 1972 and 1975 policies were short of nationalization and acknowledged indigenous technological deficiencies by allowing the TNCs, as minority shareholders, to manage the firm. In 1976, the government nationalized all the timber companies in which it had acquired majority interest in 1972. The presumption is that the government then felt competent to run the industry.

A few months before the long military regime covering the period 1972-79 was to be replaced by an elected civilian regime, junior officers in the forces, led by Flight Lieutenant J.J. Rawlings, overthrew the government and established a 3-month rule that was characterized by widespread takeover of alien businesses, especially those with Syrian and Lebanese owners. The nationalization exercise under the Armed Forces Revolutionary Council (AFRC), as this regime was called, was carried out in the name of stamping out corruption. Over 50 enterprises were affected. The period was also characterized by strong antiforeign sentiment and there is no doubt that many TNCs braced themselves for expropriation at any time.

The AFRC regime, after 3 months, bowed to pressure to hand over government to the already elected People's National Party. The next 2 years witnessed a relaxation of opposition to TNCs. However, economic crises in Ghana had reached such a level that TNCs' interest in the economy had fallen very low. For example, Firestone International sold its interest in Firestone (Ghana) Limited to the government in 1981 as a result of the economy's inability to provide a domestic market for the tire manufacturing plant. The state thus became the sole owner of the company.

Rawlings staged a comeback on New Year's Eve 1981 and ushered Ghana into what is now called the 31st of December Revolution. A major characteristic of the period, as far as foreign operations are concerned, is the setting up of Workers Defense Committees (WDCs) in all establishments which, at least in the early stages of the revolution, could shut out management and take over enterprises. At least three subsidiaries of TNCs have thus been expropriated, including a textile manufacturing subsidiary of the United African Company (UAC).

From the foregoing, certain characteristics of nationalization in Ghana may be deduced. In the first place, there has been a discernable progression in the nationalization exercise. The immediate postindependence, open-door policy passed into a period of discrimination. Differential taxes and forced reinvestment of profits were imposed on foreign firms in the early 1960s. Another stage was reached in 1968-70 when foreigners operating small enterprises were forced to transfer ownership to Ghanaians. The 1972 state acquisition of majority shares in resource-based industries brought in a new element in the form of state participation in alien business. The participation program was extended to virtually all sectors in 1975. Since then the tendency has been complete state takeover of some TNC subsidiaries based on partial compensation or confiscation. So far the reason for nationalization has either been to control the "commanding heights" of the economy as in 1976 or as a punitive measure for alleged corruption, tax evasion, or "acts detrimental" to the economy.

Terms of Nationalization

The terms of nationalization of shares in foreign firms in Ghana were explicitly spelled out during the 1972 state acquisitions. The principles were applied implicitly when the timber firms were nationalized, even though, until 1983, no payment was made, making it de facto confiscation. The terms of reference for the government negotiators in 1972, which were adhered to despite protests from the foreign shareholders, were

- fixed assets were valued at their original cost, less reasonable depreciation;
- current assets were valued at their book values, less provision for bad and doubtful debts;
- goodwill and other intangible assets were disregarded;
- technical and management contracts were signed with the TNC owners who became minority shareholders;
- terms of payment were five annual installments with the outstanding balance accruing interest at 2.5% per annum (Ghana 1972a, b).

Signing technical-management agreements and spreading payment reflected the peculiar characteristics of the industries in which the state participated, i.e., large-scale mining and timber subsidiaries of TNCs. Consequently, the other acquisitions did not have these provisions. Of course, where assets were confiscated no terms were negotiated.

Adei (1980) estimated that resources spent by Ghana in acquiring equity interest in foreign firms between 1968 and 1976 amounted to a little over GHC 100 million (under USD 90 million then) which was quite negligible considering the fact that, according to data provided by the Ministry of Land and Natural Resources between 1973 and 1976, the seven timber and mining companies alone made a total gross profit of GHC 87 million. On the whole the assets were grossly undervalued. Much of the undervaluation stemmed from the use of recorded costs of assets, disregard of goodwill, and payment of the purchase price on noncommercial terms. For example, the government spread the payment of its 55% shares in timber and mining concerns in 1972 over a period of 5 years at 2½% interest. The prevailing rates of interest then ranged between 11 and 14%. One short-term positive effect of this move on the economy of Ghana is that it reduced the opportunity cost of the acquisitions.

Criteria for the Acquisition of Foreign Firms

The criteria for the selection of industries for Ghanaian equity participation or nationalization, which was not meant to "punish" the operators for alleged crimes, have often not been made explicit. The criteria used for the implementation of the indigenization policies of 1968 and 1970 were the level of sophistication of technology used and the size of the capital employed (Ghana 1968, 1970). Thus only small-scale operations in the informal sector and the lower spectrum of the formal sector were affected. In terms of the type of foreign ownership, the affected nationals were mainly resident non-Ghanaian Africans, Syrians, Lebanese, and other Asians. TNC subsidiaries were generally not affected.

No explicit standards were specified in the case of government acquisition of majority share holdings in timber and mining concerns in 1972. The legislative instruments that formed the basis of the participation (Ghana 1972a, b) gave two objectives: to promote self-reliance; and to assume a controlling interest in the ownership of the productive facilities in the development of natural resources. The emphasis on economic independence is quite clear. Second, the government seemed to think that the sectors were strategic to the economy of Ghana and they are in terms of earning foreign exchange. Whether participation and subsequent nationalization have led to the promotion of self-reliance will be answered at the end of this study.

The consideration of technological capacity was, however, limited in the nationalization decision process. The 1972 government participation program recognized indigenous technological deficiencies by contracting technical management to the TNCs.

Despite the foregoing, one can say that technological considerations became a secondary matter. In all cases of nationalization, important considerations, such as the capabilities of Ghanaians to run the industries and the adequacy of material support upon the withdrawal of the TNCs, were all taken for granted. It is therefore clear that the government has largely acted in response to political pressures in the face of severe economic difficulties.

Objectives and Structure of the Study

Nationalization is normally seen as a mechanism for enhanced economic control and, consequently, as a means to increase national advantage. However, this is contingent upon the capacity of the nationalizing country to mobilize the necessary financial, physical, and human resources to maintain an efficient operation. On the other hand, state ownership of enterprises accords the country the opportunity to develop national technological capacity through the development of local resources, selective acquisition of foreign technologies and know-how, and effectively monitoring technology-transfer arrangements. This study examines nationalization in terms of its impact on technological capacity.

In terms of a definable objective, this study explores the relationship between indigenous technological capacity, performance of industries, and nationalization. Specifically, the background and context within which selected industries were nationalized are identified; the performance of nationalized industries is analyzed; the level of technological capacity in nationalized industries and how it relates to firm-level performance is determined; and the policy options open to developing countries seeking an effective policy toward TNC subsidiaries are examined.

The importance of such an investigation cannot be overemphasized. Besides the paucity of such studies in Africa, the economic consequences of nationalization could adversely affect the progress of developing countries as easily as they could provide opportunities for the development of indigenous technological capacities.

One assumption underlying the study in general and part three in particular has to be made quite explicit. The study is concerned with the economic implications of nationalization, and it assumes a policy objective of increasing national economic advantage. That there are other sociopolitical reasons for nationalization, such as preserving sovereignty and national pride, cannot be denied. They are simply not the focus of this study. In other words, the areas of concern pertain to economic returns in terms of private and social benefits such as profitability, employment of nationals, and development of indigenous technological capabilities. In chapter 7, however, some material gathered in the course of the study on issues such as national control, social benefits, and conservation of resources by nationalized firms is documented.

The study is organized in three parts. Part one provides a general introduction and theoretical background to the whole study: chapter 2 is devoted to the definition and explanation of the important concepts and issues in the study; the methodology and framework employed in the analysis of the leading issues are discussed in chapter 3; while chapter 4 deals with the background of the two firms used for case studies.

In part two, the performance of the two firms is discussed and external factors that affect their performance are evaluated. Because the firms are in the same industry, a comparative analysis of the external factors is possible and is undertaken in chapter 8.

Part three contains an examination of the level of technological capacity that exists in the two firms; an appraisal of the effort made to build their technological capacity in the prenationalization era; and an analysis of the impact of nationalization on this capacity. In the final chapter, lessons are drawn from the empirical studies to serve as a basis for policy recommendations.

ANALYTICAL, CONCEPTUAL, AND THEORETICAL ISSUES

2

Defining Some Terms

The various ways in which terms like nationalization, technological capacity, and indigenization are used in the literature demand a brief definition of them at the beginning of this work to avoid ambiguities.

Nationalization, as used here, pertains to state takeover of privately owned companies. In the context of this study, it refers specifically to the takeover of direct foreign investments (DFI). Where the partial acquisition of shares takes place, the term used is participation. Sometimes the forced divestment of DFI has taken the form of the government prescribing that shares should be sold to nationals - individuals and companies. In such a case, the appropriate term is indigenization. Indigenization may apply to shares or personnel of the companies.

The specification of technology related concepts is even more difficult. This study will follow Nyakotey and Adei (1983: 1) in the assumption that "technology is knowledge. It is the sum of knowledge, skills and methods related to the production, distribution and consumption of goods and services including the organization there of. In other words, the essence of technology is technical capability of people rather than the output of a system." Imparting such knowledge to another is the essence of technology transfer. The successful transfer of technology leads to the building of technological capability.

Technological capability can exist at the level of the firm, the industry, or the country. "It consists of the ability to identify the most relevant technology for a particular purpose, to acquire it on the best possible terms, and once acquired to assimilate the technology internally. It also includes the ability to modify the required technology so as to adapt it to the specific circumstances of the user. Ultimately it includes the ability to create innovations internally as well as to market them commercially" (Girvan 1981). What stands out clearly in Girvan's definition is the fact that technological capability involves the ability to do certain things.

At the firm level, technological capability will be reflected in the ability to undertake the functional activities, such as planning, production, maintenance, and marketing, that go into the successful running of a factory or firm, to identify problems, and to design solutions to them.

Farrell (1979) has identified two kinds of technology or skills in this regard as static or dynamic. Static technology refers to the kind of knowledge that enables the possessor to carry out certain routine tasks and functions successfully. The skills of a copy-typist may fall into this category. On the other hand, the possessor of dynamic technology understands the scientific principles governing his work and as such is capable of improving, modifying, or changing it to suit changing circumstances. Dynamic technology is the capacity to innovate and invent.

A subset of static and dynamic technology, needed to keep a factory going in the short run, is what Farrell calls "critical skills." Without critical skills a country dare not nationalize because it would imply the eventual closure of the firm. With only critical skills, nationalization should be followed by rapid upgrading of indigenous technology or by hiring expatriates who have the missing skills, or both.

People with skills and technical know-how are indispensable to the efficient running of modern industries. Even simple skills such as toasting bread become technologically demanding once the scale of operation goes beyond feeding a few people. Skill requirements are therefore important ingredients in the assessment of technological capacity. But it is difficult to conceive of a skilled person in any modern industry who does not need some resources to work with. The engineer needs tools and the accountant needs basic stationery and some simple adding machines, if not a computer. Moreover, they all need an institutional framework that allows for the harnessing of knowledge and resources to achieve the firm's objectives. Technological capacity is the sum total of people with the requisite skills, the stock of technical knowledge for them to draw upon, the tools and instruments for them to work with, and the institutional framework necessary for realizing company or national objectives. Bell's (1979) view that there is more to the successful operation of a firm than capable men cannot be overemphasized. In addition to people with skills to carry out technical functions, Bell identifies three other resource components in the capacity to run a production unit successfully:

- a stock of technical knowledge that is accessible for skilled people to draw upon in carrying out their various functions;
- tools and instruments to carry out the various functions; and
- institutions that provide the framework for accumulating and deploying the stock of skilled people, technical knowledge, and instruments.

Girvan (1981) noted that technological capacity may exist at the level of the firm, at the level of an industry, or at the national level. This observation is of crucial importance to nationalization considerations because nationalization may lead to the withdrawal of material and institutional support by a parent company. The country may not have a problem making good deficiencies at the firm level, however, if technological capacity exists at the industry or national level. In such a case, the less formidable problem will be that of redeploying resources.

Transfer of Technology

The level of indigenous technological capability within the subsidiary of a TNC is a function of transfer that has taken place. Technology is said to have been transferred when nationals within the firm have developed the ability (both static and dynamic technologies) to operate the industry successfully. "Successful operation implies the capability of carrying out the complex of functions or technologies necessary for the conduct of the industry. It also implies the existence of a problem solving capability" (Farrell 1979).

Certain factors are necessary for the successful transfer of technology by TNCs to developing countries. The first pertains to the availability of people with basic training in fields essential to the successful running of modern industrial complexes such as engineering, industrial management, economics, marketing, and accounting and is principally the responsibility of the host country.

The second precondition is a legal and administrative framework of science and technology policy in the host country for ensuring the importation, transfer, and assimilation of technologies. Such a scheme will include ensuring that appropriate technology is imported into the country. De Castro's (1979) analysis of post-war technology acquisition in Japan shows that the country had a well-defined strategy to import western petrochemical technology and ensure its assimilation by Japanese firms to the extent of adapting them and even generating new technology. This was achieved by the Japanese Ministry of Foreign Trade acting through its Agency for Industrial Science and Technology in particular. Such a policy is lacking in most developing countries.

The findings of Adei and Nyakotey (1982) have shown that Ghana has no explicit technology policy. The conclusion of Adei (1984) about Ghana's technology policy was

> There is very little by way ot an explicit technology policy ... in the country. Attempts are now being made to achieve this through the Ghana Investments Centre. Meanwhile industrialists and the government agencies enter into various forms of technology agreements which indicate an implicit technology policy. A look at the structure of the implicit policy indicates that financial institutions, through their credit lever, probably remain the single most important factor in (technology) decision making besides the entrepreneur himself. Unfortunately, this avenue has not been exploited (to ensure effective transfer of technology) despite the tact that the institutions are largely state owned.

In the absence of an effective national technology transfer policy, the amount of know-how imparted depends on the goodwill of TNCs.

Technology transfer starts at the project identification stage and continues through feasibility, technical design and specification, choice of suppliers and contract negotiations, installation of plant and equipment, and start-up of operations stages. Many of the basic underlying principles are acquired before the company starts commercial operations. A major factor accounting for deficiencies in the capabilities of nationals within TNC subsidiaries is that most of the activities at these stages are undertaken by expatriates under the control of parent organizations. Nationals come in to meet an already functional setup. The involvement of nationals at the preliminary stages of company establishment is vital to the transfer of technology.

Behrman and Wallendar (1976) have identified six important channels for the transfer of technology in a firm:

- Documentation, i.e., exposure to manuals, drawings, designs, layouts, process instruction, etc.;
- Instruction, including formal instruction at firm training sessions or leave-of-absence to study in schools, colleges, or universities and on-the-job training and exposure to the right kind of jobs;
- Conferences and seminars;
- Visits and exchanges of specific individuals among affiliates or between them and headquarters;
- Supply of specialized equipment for the purpose of technology transfer;
- Working with troubleshooting teams.

All things being equal, voluntary transfer of technology to developing countries will be partial or incomplete. TNCs are known to transfer only operational skills and a minimal set of dynamic technology to nationals leaving "brain" activities to be performed overseas or by expatriates engaged in the firm. Thus nationals may not have the critical skills to operate the enterprise even in the short run (Farrell 1979: 276).

The foregoing implies that the host country may discover on nationalization day that its nationals cannot maintain a company even though some of them have had decades of experience with the company and bear high-sounding titles. They may be so ignorant of the core technology that they cannot run the company with all the demands of identifying problems and designing solutions to them. Far from being incidental, the distribution of functions between the head office and subsidiaries of TNCs in a developing country follows a systematic pattern which is dictated by sound private commercial consideration, such as keeping oligopolistic control over know-how, maximizing profit (especially profit accruing overseas), risk aversion, etc.

Three categories of functions with corresponding technological skill requirements may be identified for the running of a TNC subsidiary: operative functions, strategic functions at the subsidiary level, and apex technological functions.

Operative Functions

These are functions that do not provide access to the core technology of the enterprise. The performers of these functions are generally classified as operatives. They may include as many as 95% of total employees in a firm, depending on the type of company. The skills needed for the efficient performance of these routine activities will normally be transferred to nationals for economic and practical reasons. It will be financially unwise to use expatriates to fill these positions because an expatriate may cost the company as much as ten times the cost of using nationals. The engagement of expatriates on such a scale would also arouse economic nationalism and increase the risk of nationalization.

Strategic Functions at the Subsidiary Level

Notwithstanding the desire of a TNC to control important functional positions from its headquarters, there are some so-called brain activities that must be performed on the premises of the subsidiary or in the host country. For example, chief executive functions, regular maintenance of plant and equipment, testing, and quality control have to be undertaken locally. The performance of these functions by nationals does not only introduce them to the critical skills needed for the operation of the firm, but may also lead to knowledge of sensitive and patented technology. Such functions will be reserved for expatriate employees if possible. Where nationals must be engaged, gaps may be created in their know-how by transferring certain parts of the functions overseas or to lower ranking expatriates in the firm, or by simply farming out jobs to nationals in such a way that none of them can manage affairs independently without reference to a superior officer, usually an expatriate. It is not uncommon to find a situation where a national production manager is put in an air-conditioned office while an expatriate supervisor controls the operation of the plant. Within the firm, everybody knows who is the real boss.

Such practices may be regarded as unacceptable by host countries. But the company has to operate on sound business principles to ensure maximum private commercial profitability. It is up to host countries to make policies that ensure effective technology transfer and maximize national economic advantage.

Apex Technological Functions

On the other hand, TNCs are likely to retain at headquarters functions that relate to the very core of their technology such as research and development (R&D), troubleshooting services, product design and specification, commercialization of innovations, as well as those pertaining to the transfer of profits overseas. Outside the home office, such functions may also be undertaken in "safe countries" for any or a combination of the following reasons: advantages of centralization, especially in the cases of R&D and overseas marketing; control over technology and proprietary rights; reduction of risk of nationalization; maximizing profits accruing to the parent through service charges, and even transfer pricing (Lall 1973).

To the extent that the above hypothesized division of functions is true, subsidiaries of TNCs in developing countries can at best be regarded only as half-factories. It will, therefore, be an illusion for the host country to presume that nationalization places a functional organization at the disposal of the country.

Nationalization and Technological Capacity

It is important for nationalization to be carefully planned and executed. An assessment of the technological situation for petroleum production by Farrell (1979) indicated that Trinidad-Tobago did not have the technological capability to run the industry. He discovered depth weaknesses in the capabilities of nationals in that the country possessed some staff with skills in a particular area, but obviously not enough. There were breadth weaknesses also, where the country did not possess any apparent skills in certain areas. The TNC had so controlled the transfer of technology, keeping brain activities at the metropole that significant gaps existed in indigenous technological capability. Fortunately for Trinidad-Tobago, Farrell's study was a prenationalization one. Even if nationals are judged to have the requisite technological capabilities to run an industry, successful nationalization will depend on the existence of patent lock-ins, the provisions made to ensure material support, such as finance, spare parts, and necessary raw materials, as well as making good services hitherto offered by the TNC from its headquarters.

The impact of nationalization on the capacity to run the firm will depend on a combination of several factors. Vital services provided by the TNC from headquarters are normally cut off on nationalization. These may include the supply of spare parts, overseas marketing, and troubleshooting services. In other words, the subsidiary has to operate without the paternalistic support of the parent.

Secondly, expatriate personnel engaged at the subsidiary may leave to join other subsidiaries of the parent. Some TNCs operate a system whereby expatriate employees, after a certain number of years of service in the company, attain an international status with the parent company. This is the case for United African Company which owned African Timber and Plywood Limited, one of the companies studied for this report.

There is not even the guarantee that nationals with high-level skills, such as engineers and accountants, will remain in the employment of the company after nationalization. Factors that weigh against their retention at the factory include loyalty to TNCs, which may be buttressed by the opportunity to work in other subsidiaries within the country or outside. Working conditions in the firms also tend to deteriorate after nationalization, as civil servants enviously watch the relatively better conditions of service in TNC subsidiaries.

The type of employee who is most likely to remain with the firm after nationalization is the operative. Even then, in most developing countries skilled artisans are very scarce and, unless good working conditions are maintained, they may seek alternative employment. Thus, even under ideal circumstances where a TNC has developed indigenous technological capabilities, there may be inadequate human and material resources to sustain operations after nationalization.

On the positive side, national control over the operations of the firms opens up the opportunity to unpackage technology so that the country imports only the specific components lacking in the national technological capacity. Technological packages often contain much that is standard and ordinary, that a country need not pay special fees for. A case in point is the supply of equipment under turnkey projects. The package includes civil engineering works, motors, and belts. Invariably, only some of the equipment and processes are patented, yet, without unpackaging, the country pays extra fees for everything. Cooper and Hoffman (1981) summarize the issues involved in technology acquisition and the importance of unpackaging. However, the international patent system may hinder this process (UNCTAD 1975, Vayrynen 1976).

The ability of nationally controlled establishments to become training grounds for the acquisition of technological capacity has been demonstrated clearly by Maxwell (1977) and Dahlman (1978) in connection with the steel plant of Acindar S.A. in Rosario, Argentina, and Usiminas Steel Plant in Brazil, respectively. In both cases, national control of the firms facilitated the move from technological dependence to the development of a high level of local capability.

Nationalization therefore is a double-edged instrument. Its success depends on factors other than the mere act of state takeover of foreign companies.

Choice of Companies

The study adopts a case study approach using two companies: African Timber and Plywood (Ghana) Limited (ATP) and Mim Timber Company Limited (MTC). ATP and MTC were among four major foreign-owned timber companies (and their 100% subsidiary wood, marketing, or service firms) of which the Government of Ghana acquired 55% shares in 1975, along with all foreign mining ventures. The other two timber companies were Gliksten West Africa Limited (GWA) and Takoradi Veneer and Lumber Company (TVLC). The four timber companies were subsequently nationalized in 1976. ATP, GWA, and TVLC had been subsidiaries of transnational corporations (TNCs) while MTC was established by a British resident expatriate. Thus while the other companies operated as part of an international system, MTC had no direct connection by way of ownership with any company outside Ghana.

Because of limited resources, the project began as a one-company study and ATP was chosen. ATP was the biggest of the three TNC subsidiaries. It seemed to share similar difficulties with GWA and TVLC after nationalization even though TVLC, located in the harbour city of Takoradi, has fared better than the other two. ATP and GWA are located in rural areas and the companies bear heavy social costs as they have to provide basic infrastructural facilities including power, water supply, medical services, and maintenance of extensive main road and feeder road systems. However, the study was expanded to include MTC. The difference in ownership structure before nationalization itself was quite interesting. More than that, MTC, although sharing the same external constraints as the other firms, has performed relatively better since nationalization.

ATP has been in operation since 1946, initially under the ownership and management of Unilever International's United African Company Limited (UAC). The company was nationalized three decades after its incorporation. If time is required for transfer of technology, 30 years should be enough.

MTC was established at about the same time as ATP. Apart from one major distinguishing factor (not being a TNC subsidiary), it operates within an environmental context identical to ATP's, thus providing a strong basis for a comparative analysis of nationalized timber companies.

Methods of Research and Sources of Data

A combination of desk research, direct observation, and interviews (using a questionnaire) were adopted for the study. The desk research took two forms. A brief survey was made of the relevant literature pertaining to the timber industry and to issues on nationalization and technological capacity. In this connection, the principal researcher paid a month's visit to the Science Policy Research Unit (SPRU) at the University of Sussex during which he had fruitful interaction with the research fellows of the unit and the use of library facilities. Also useful was information obtained from the working papers of an International Development Research Centre (IDRC) sponsored Technology Policy Workshop in Monrovia (October 1982). Some data were obtained from published and unpublished materials from government agencies in Ghana such as the Central Bureau of Statistics, the Central Revenue Department, the Ghana Timber Marketing Board, and the supervising ministries of the nationalized industries.

A questionnaire was prepared and sent to the firms. Follow-up visits were undertaken to ensure that the questionnaire was completed in the required manner. Such visits afforded an opportunity for first-hand observation of the firms' operations and for discussions with personnel where necessary.

Visits were also undertaken to analogous firms in Nigeria and the United Kingdom to improve the principal researcher's acquaintance with the available alternative technologies in the respective industries, as well as to find bench marks for analysis. The visit to the U.K. enabled the principal researcher to talk with major customers of Ghana wood products as well as head-office staff of UAC, some of whom had not only been involved in setting up ATP but had also held leading functional positions in the firm.

Problems Encountered

The study was faced with three analytical problems. These related to indicators of performance, measurement of technological capacity, and how to relate the two in light of other exogenous and endogenous factors affecting factory performance. Of these, the first was least formidable.

Performance Indicators

The approach adopted in selecting indices to measure company performance was first to examine the objectives usually given to justify state takeover of foreign firms. In Africa, these may be summarized as follows (Adei 1984):

- controlling the "commanding heights" of the economy, a euphemism for the national control of strategic industries;
- increasing the economic returns, both in terms of profits and foreign exchange earnings, accruing to the host country and thereby increasing national savings;
- generating employment for nationals especially at the higher functional positions within the firm;
- conserving nonrenewable natural resources;
- orienting production toward local resources;

- utilizing and developing national technological capabilities; and

- achieving economic independence.

From the list of nationalization objectives above, three categories emerge. The first relates to control of the firms in terms of taking decisions, making plans, and generally deciding on the main direction and orientation of the enterprise, i.e., assuming the main functions of a board of directors. Controlling the "commanding heights" and "achieving economic independence" come under this category.

Control over nationalized industries may facilitate the second group of objectives which involve gearing the activities of the firm toward achieving certain national economic goals. This category includes increasing employment of nationals especially at the senior technical, administrative, and managerial levels; conserving nonrenewable natural resources; orienting production toward local resource utilization; and developing indigenous technical capabilities.

Finally, there are objectives that relate to maintaining a viable commercial venture in terms of profits and foreign exchange earnings. Even though maximization of profit may be sacrificed in a nationalized industry in the pursuit of other sociopolitical aims, it is important that the government evaluates the cost of pursuing these other objectives, in terms of foregone financial opportunities and other commercial criteria such as the rate of return on capital employed, maximum capacity utilization, and level of waste. We found that where the state is not capable of financing a loss-making firm, the achievement of all other objectives becomes dependent on the commercial viability of the enterprise. Thus our starting point for measuring company performance in this study will be a set of criteria from the point of view of the theory of industrial enterprises (microeconomics) with reference to the particular industry under review.

The indices selected as important performance indicators were total production, capacity utilization, quality of products, level of waste, volume of local sales and exports, productivity per factors employed, profitability or return on employed capital, and employment levels. A selection of indices from this list are employed in chapters 5 and 6, where productivity and financial performance of the two timber companies are analyzed. Chapter 7 concludes with discussion of issues pertaining to national control of firms, employment, conservation of resources, and the use of local materials which, along with technological capacity, are given as reasons for nationalization.

Measurement of Technological Capacity

More difficult to specify were technological capacity indicators. Girvan (1981: 15) provides a useful summary of attempts to specify technological capacity. The emphasis, however, is on capacity at the national level rather than at the factory level. Farrell (1979: 245) specified some elements of technological capacity at the firm level as follows.

- The existence of people with foundation and training in the basic (scientific) aspects of knowledge relevant to the particular area of concern;

- The possession by these people of a certain amount of operational experience;
- The existence of an organization in which the skills are resident and can be harnessed and deployed in pursuit of given goals;
- A probsensol (problem sensing and solving) mechanism within the organization; and
- The existence of a certain complex set of values and attitudes which are important with respect to approach to problems.

It is apparent from Farrell's list that it is very difficult to measure technological capacity. How does one measure the "probsensol" mechanism within the organization or the "complex set of values and attitudes ... with respect to approach to problems," for example?

Moreover, we have noted that the performance of skilled personnel at the firm level depends upon the stock of technical knowledge accessible to them and tools and instruments at their disposal (Bell 1979). The personnel of a company are responsible for the equipment they use only to the extent that the state of the equipment may depend on general and technical management personnel. For example, management may not make adequate depreciation provision to replace worn-out equipment. Again, semiskilled technicians may do more harm in the course of repairing machinery and equipment. But initial capitalization, for example, is the responsibility of shareholders.

Another problem connected with technological capacity indicators is that the indices are not independent of each other. For example, the level of foundation, training, and experience for engineering personnel will affect the rate of machine breakdown. Both the rate of machine breakdown and the skills of personnel are indicators of technological capacity.

This study does not seek to solve this question of interrelationship among the various indicators of technological capacity. Instead cumulative evidence will be gathered which indicates the level of technological capacity. To that end three complementary approaches are adopted.

The first is a static analysis whereby the qualifications and experience of employees or nationals, state of machines and equipment, stock of inputs, organizational structure, etc., after state takeover, are compared with the prenationalization situation. This approach has two major deficiencies. It will not be suitable for functions, including troubleshooting services, performed by the TNC parent company and its subsidiaries abroad and it assumes that the TNC operates the firm at an optimal level of efficiency.

The second approach seeks to overcome the deficiencies of the first. This is done by assessing, from the theoretical point of view and through visits to analogous institutions, a set of critical resources needed to run the firms. The major drawback of this complementary approach is that in the end it will be influenced by the subjective evaluation of the researcher.

Third, in a dynamic setting, technological capacity must be manifested in the successful performance of technological functions. The performance indicators are, therefore, partial indicators of technological capacity. The following functions are necessary for the continued operation of the firm.

Organization technology
  planning
  a reporting mechanism, an efficient information system
  investment in human resources
  engagement of outside contractors
  handling of industrial relations problems, etc.

Production technology
  maintenance of production levels
  changes in product mix and quality
  keeping wastage to the minimum
  maintaining productivity levels and improving upon them
  meeting schedules
  substituting local raw materials
  introducing new methods of production
  cost reduction, etc.

Financial technology
  costing of products
  financial accounting, information keeping
  audit control, etc.

Engineering technology
  maintaining machines (preventive maintenance and repair)
  retooling
  capacity stretching modifications
  fabricating spare parts
  designing new systems and installing, etc.

Marketing
  maintaining market shares
  responding to market or demand changes
  overseas sales
  distribution
  debt recovery, etc.

Capacity can be measured by appraising the ability to undertake these vital functions in terms of human and material resources at the disposal of the firm.

Other Factors Affecting Performance

The next major problem in the study was how to distinguish between the role of technological capacity in the performance of nationalized industries and other exogenous factors that affect firm operations. It was noted in chapter 2 that nationalization implies state or public ownership. The mention of public ownership in developing countries immediately raises issues such as political interference, inefficiency, and even corruption. Then there are certain macroeconomic variables that affect all firms operating in a given economy or sector. These include fiscal and monetary measures, exchange rate policy, inflation, labour regulations such as redundancy policy, and prices and incomes policy.

The question of distinguishing between these variables is not easy. Theoretically, one could develop quantitative indices or dummy variables for these and use statistical techniques, such as regression analysis or any of the other multivariate analysis techniques, to test the contribution of each explanatory variable. This approach has not been adopted, partly because invariably attempts to quantify qualitative factors introduce undue subjectivity into the analysis, and partly because such an approach was beyond the resources available for this project. The alternative approach adopted is the qualitative assessment of the relative contributions of each variable. Using two timber companies meant there was an opportunity to do a comparative study too.

Other Problems

It was difficult to get adequate information from the companies. Record keeping was not good. In many cases, gaps existed in data gathered from the firms. Technological capacity investigations involve asking very sensitive questions. Such enquiries demand detailed and sometimes very personal answers. It was not surprising then that initial responses were reserved. However, the response improved later and the research team was given access to available data.

The locations of the timber companies created another problem. The research team was based at Ghana Investment Centre, Accra. Trips had to be undertaken to MTC (404 km) and ATP (462 km), both relatively inaccessible from Accra.

BACKGROUND TO THE CASE STUDIES

This chapter presents a brief description of the Ghanaian timber industry and of the two companies that form the subject matter of the empirical section of this study.

Ghana's Timber Industry

Ghana abounds in rich timber resources that provide a potentially viable industrial base for the economic development of the country. Until recently, timber ranked next to cocoa in terms of the country's export earnings, accounting for about 14% of the average annual export earnings until 1970. Its contribution dropped to 10% between 1970 and 1975 and, by 1980, was a meagre 5% of the country's total foreign exchange earnings. Today the timber industry contributes about 5.5% of the country's gross domestic product (GDP), employing about 250,000 people and providing a source of livelihood for about two million (Karkari et al. 1983).

Compared to cocoa or mineral production in Ghana, the timber industry is highly integrated vertically and includes logging, sawmilling, plymilling, veneer milling, chipboard milling, and other production lines such as building components and finger flooring. Apart from logging, which is principally extractive in nature, all other activities in the industry are connected with processing.

Production and export of unprocessed commercial hardwood began in the 1900s. Production increased until the late 1960s at a rate of about 1.5-2.0 x 10^6 m^3 per year. It is unfortunate, therefore, that exports have declined since the 1970s. The decline in export of round logs may be attributed in part to a change in government policy. Until the 1970s, the major preoccupation of all timber companies in the country was felling and exporting logs with no commitment to processing; in the early 1960s almost 75% of production was exported. Since 1980, the proportion has declined to less than 20% as a result of government policy to encourage local processing. The drastic decline in timber exports, however, cannot be explained only in terms of the ban on export of some primary species in 1980. For example, timber exports valued at USD 124 million in 1973 had fallen to USD 27 million by 1980.

Since 1980, export of unprocessed logs has been banned by the government for 14 primary species, resulting in significant reduction of Ghana's timber exports. The timber companies responded by acquiring machinery and equipment for processing plants ranging from sawmilling to chipboard milling. But according to a Ghana Timber Marketing Board estimate, the total output of all areas of the industry, except plymilling and dimension milling (producing shaped wood to form components of furniture, buildings, etc.), declined drastically between 1977 and 1982. This resulted in gross underutilization of installed production capacities (Table 1).

The declining trend with the attendant low capacity utilization reflected the general decline in the Ghanaian economy. Besides technical problems, the industry is marked by obsolescence and frequent breakdowns of machinery and equipment. The older companies, which are mainly former subsidiaries of TNCs, are operating with machines that are 30 years old and over. The new establishment also sometimes acquired already old, secondhand machines. The demand for spare parts and regular maintenance is, therefore, quite high. In all cases, lack of foreign exchange to bring in vital inputs, including spare parts and lubricants, has been among the major constraints. The situation has not been helped by the poor state of road and rail networks and the deteriorating state of port facilities. The timber industry is capital intensive and, by implication, import dependent. The sawmilling sector of the industry, involving about 60% of total output, is moderately capital intensive. The logging operations are equally capital intensive with their reliance on power chain saws, caterpillars, and other heavy-duty equipment and trucks for haulage. All of these call for a constant and adequate supply of replacement equipment and parts and a substantial amount of consumables such as oils and lubricants.

In the early years, before independence, the industry was dominated by foreign TNCs, notably African Timber and Plywood Ltd (ATP), Takoradi Veneer and Lumber Company (TVLC), Gliksten West Africa Ltd (GWA), and Mim Timber Company (MTC). Our survey revealed that these four companies (together with Bibiani Logging Company, a wholly Ghanaian owned firm) accounted for about 80% of foreign exchange earnings of the timber industry at that time. The companies operated on very liberal terms paying nominal fees in the form of royalties. More Ghanaians entered the industry in the 1960s (Ghana, Central Bureau of Statistics 1972). Ghanaian participation was taken a step further in the early 1970s when, in October 1972, the government

Table 1. Total national rated capacity and output of timber and timber products by area of activity, 1982.

Area of activity	**Installed capacity ('000 m^3)**	**Output ('000 m^3)**	**Capacity utilization (%)**
Logging	2500	600 (1640)[a]	24
Sawmilling	1100	275 (565)	25
Plymilling	100	63 (56)	63
Veneer milling	45	20 (18)	44
Chipboard milling	15	6 (8)	40
Dimension milling (including flooring and doors)	150	50 (40)	33

[a] 1977 figures are given in parentheses to illustrate the decline in output during this period.

Source: Karkari et al. (1983).

acquired 55% shares in four TNC subsidiaries with the aim of expanding its economic activities to cover areas other than cocoa and mineral exports. It also sought to transfer management and technical know-how to Ghanaians with a policy geared toward increased employment of Ghanaian senior personnel (Adei 1980: 25-27).

In 1976, a few years after the government had acquired shares in the big four timber companies, the TNC subsidiaries were completely nationalized resulting in the departure of many expatriate personnel engaged in these companies. With their departure, the industry had limited foreign investment; foreigners who continued to operate were either naturalized Ghanaians or they operated their firms as domestic companies.

The performance of the timber firms, especially those run by the government (notably ATP, GWA, and TVLC), has been disappointing (TIHOC 1981). Two of these firms - African Timber Company and Mim Timber Company - are studied in detail in the following chapters.

It is generally observed that timber as a resource in Ghana is being depleted at a very fast rate as domestic and foreign demand for wood products increases. By 1977, it was estimated that about 5×10^6 ha of forest area had been granted to logging firms and individuals in the form of concessions. For the past two decades, the area of closed forest in the country has been reduced greatly, owing to the about 1.3% annual rate of clearing for farming. The reforestation program of the government has virtually stopped, even though loggers pay special fees toward replacement of logs extracted.

African Timber and Plywood (Ghana) Limited

ATP was set up by the United African Company Limited (UAC), a subsidiary of Unilever, in 1946. It is situated on 601,396 ha at Samreboi in the western region of Ghana. The company had to build a complete township within a tropical rain forest 80 km from the nearest railhead. Access roads had to be built and maintained as well as all the services that are needed in a modern industrial township - water, power, medical, and sanitation facilities. To the local employees, the amenities made Samreboi a model town in Ghana, a "small London." The following extract (UAC 1981) briefly describes the major development in the company since 1951.

> In 1951 a sawmill was commissioned, this was followed by a plymill factory built in 1960 and commissioned in 1961. In 1970 a Parquet Finger Flooring production line came into operation. In 1974 ATP commenced with production of timber buildings, using designs evolved by its counterpart ATP (N) Limited based in Sapele, Nigeria.

The company was fully owned by UAC until October 1972 when the government took over 55% of shares in the company under its policy to increase its stake in natural-resource based industries. UAC, the minority partner, was designated to continue to manage the company under a technical management agreement. The agreement was terminated in 1976.

ATP is an integrated wood complex combining logging with processing. The company extracts virtually all of the logs it uses from its own concessions to feed all its production lines. The company has a major advantage over most timber companies in the world in that it has a ready supply of prime tropical hardwood close to the factory. "Enumeration records indicate that within the forest reserve, the tonnage of timber is approximately 2500 per square mile [1 square mile = 259 ha] while in the open forest the tonnage is 1000 per square mile," mainly top-class tropical hardwoods such as odum and sapele (TIHOC 1981: 6).

In terms of scale of operation, ATP used to be the biggest concern of its kind in Africa south of the Sahara. Between 1970 and 1974, the company produced on average 160,000 m^3 of log, 55,000 m^3 of lumber and 13,500 m^3 of plywood annually. The company employed about 2500 full-time employees and several hundred at a time on a part-time basis.

The technology employed at ATP is not different from any logging, sawmilling, and plywood manufacturing business based on tropical hardwood. However, the scale of operation involves the use of heavy-duty machinery and equipment that requires a high level of engineering capability. With nearly 3000 employees at one time, it can be described as a big organization by international standards.

The basic wood-processing industry, however, does not involve any patented technology. The technology is relatively mature and, from local and foreign labour markets, a country can assemble the requisite human and material resources to operate the industry.

Under UAC's management, the company had technological support of UAC International Timber Division with its headquarters in London. From there, all production specifications, shipping schedules, and export marketing were undertaken. Other services rendered from London included the acquisition and supply of inputs including technical personnel and troubleshooting teams. ATP produced mainly exports, operating as a de facto production wing of UAC International Timbers. The implications of this arrangement for indigenous technological development will be examined later.

Mim Timber Company Limited

Mim Timber Company (MTC) was established about the same time as ATP, in 1947, at Mim in the Brong Ahafo region of Ghana, by a British resident in the country. Adei (1984: 9) notes that the "history [of foreign timber companies in Ghana] shows that they were all established during the post World War II reconstruction era. With the exception of TVLC (Takoradi Veneer and Lumber Company), all the other companies were controlled from Britain, Ghana's former colonial master. All the firms except TVLC had to establish centres in the forest providing necessary infrastructure to meet the requirement of a modern manufacturing process in a completely rural context. As such they became visible examples of foreign enclaves."

In 1983, the main products of MTC were logs, lumber, profile boards (system building components), and veneer. Once again, there is a defined historical sequence in the introduction of new products with increasing emphasis on value added. The company started with the extraction of logs and lumber production in 1947. Profile boards and veneer production were added in 1970 and 1980, respectively.

The company has its own concession which totaled 144,847.8 ha in 1984. The company is less well endowed in terms of availability of wood than ATP. The company has had to depend on private contractors from time to time for selected species of wood that are not available in sufficient quantities in their limited forest concession.

The government acquired 55% of shares in 1973. But, in 1977, the foreign minority shareholder disposed of all his shares to the government which became the sole shareholder. The constraints imposed by the harsh economic situation in Ghana and the forced divestment of part of the company's concessions to Ghanaian firms and individuals precipitated the withdrawal of the minority foreign shareholder.

Today MTC is, by scale of production, the biggest and most successful timber venture in Ghana. It appears to be a success story in a declining industry. The company has responded to the constraints of lack of foreign exchange and overvalued currency by moving into high value added lines. The fact that the company has always operated as a complete entity from Ghana has far-reaching consequences for the development of indigenous technological capacity.

Part II

Performance of the Nationalized Timber Companies

The analysis of the performance of the companies has been constrained by availability of data. The following evidence, largely gathered from the companies, combines both qualitative and quantitative information. Although it was sometimes difficult to reconcile the details of actual figures from alternative sources, what is presented reflects sufficiently the directions of the selected indicators. Within the constraints of available data, this chapter analyzes the performance of African Timber and Plywood Limited (ATP) and Mim Timber Company Limited (MTC) over the period 1972-83. This chapter concentrates on physical output, rate of efficiency, and capacity utilization in the firms and an attempt is made to compare and contrast their relative performance.

Forest Concessions

The main raw materials of ATP and MTC are round logs extracted from the companies' timber and forest concessions. The Government of Ghana, through the Ministry of Land and Natural Resources, allots forest concessions, on application, to timber companies and private loggers. ATP depends solely on its 601,396-ha concession for all its timber needs. According to the Senior Manager, Forest Operations, the company's timber resources can sustain full production on all its lines at 1973 levels for at least 18 years on "first entry" basis. First entry implies going through the forest and selecting only first-class or prime species of trees, leaving many commercially valuable and marketable trees to be exploited later, on second or even third entry. On the other hand, MTC has 144,848 ha of timber concessions or about a quarter that of ATP. Much of it has been heavily exploited on first-entry basis.

Both companies face two problems regarding the long-term availability of timber. First, the forestry department of the government, which levies a duty per tree felled for the purposes of planting new species, has for the past 15 years virtually ceased to replant trees. The revenue collected has found its way into general expenses and there is very little hope of resuming urgently needed reforestation without the companies themselves being entrusted with the responsibility.

The second problem is the clearing of forest land by farmers. Ghana has two types of forest: open forest, which inhabitants may clear for farming, and forest reserves or closed forest. The timber companies exploit the former while it lasts. Virtually all farmers make their farms by clearing the forest and burning almost everything. As a result, the open forest part, about half, of the companies' concessions are diminishing every year. In forest reserves, farming is officially forbidden. But, due to inadequate supervision by the Forestry Department, the author found farms in the heart of the ATP reserves.

The number of logs extracted in any period is a function of the size of the forest concessions, the density of trees, and the extractive capability of the company. The extractive capability of a company depends not only on its logging operations, but also its road-making ability. These functions require heavy-duty equipment and machinery, such as caterpillars, graders, timber jacks, mobile cranes, tractors, fork-lifts, and trucks. The availability of such resources, their maintenance and regularity of supplies such as oils and lubricants, diesel, and petrol in addition to spare parts are critical determinants of technological capacity with respect to forest operations.

Products

Two categories of products are produced by ATP and MTC, namely logs and processed wood, that must be distinguished to avoid double counting in examining the data. Logs are used as inputs for the production of all the other products, while some, at least before the 1980s when direct export of 14 primary species of logs was banned, are also sold as final products. Both companies began by producing logs and lumber and added their processed products later.

ATP's main products are round logs, square logs, lumber plywood, black board, building components, parquet finger flooring, and box wood. The sawmill produces lumber and off-cuts for all the other lines except the plymill which can take in logs to be peeled into veneer and pressed into plywood. Very large logs may be split or shaped in the sawmill before being sent to the plymill. All the products of ATP were introduced by the UAC management.

MTC, on the other hand, has fewer lines of production. At the time of nationalization, logs, lumber, and profile boards were being produced. Thus the company had fewer and less sophisticated lines of production to handle at the time of nationalization compared to ATP. Since then, production of veneer has been introduced in collaboration with a German company that supplied the machinery in exchange for some of the veneer produced. Because MTC does not use its veneer to produce plywood, it does not require foreign inputs like glue needed in the production of plywood.

It may be said that at the time of nationalization of the two companies in 1976, ATP was technologically more advanced. This fact is quite important because, in the event of adverse change in technological capabilities, ATP would be affected more than MTC.

Round Logs

With the exception of 1975, annual production of round logs at ATP never fell below 100,000 m^3 until 1979 (Table 2). Record production levels in excess of 150,000 m^3 per annum were being achieved at the time of government participation in 1973. There was a drop in 1975 to 93,738 m^3, but this was largely the result of the worldwide economic recession after the 1973 oil price increase. Statistics (FAO 1984) indicate that, for example, world demand for sawn timber

Table 2. ATP production (m^3) by type of commodity, 1970-83.

Year	Round logs	Square logs	Lumber	Plywood	Black board	Finger flooring	System building	Box wood
1970	177233	2306	60208	13705	1975	NA[a]	NA	305
1971	164241	3980	52092	13825	2100	284	NA	391
1972	171712	3232	54978	13874	2177	2609	NA	535
1973	157967	393	53300	14632	2211	3173	NA	468
1974	143392	69	54299	12976	1406	3737	NA	457
1975	93738	360	28429	7415	1050	2670	NA	299
1976	133800	300	39300	8100	1900	1000	1800	200
1977	191626	182	34653	8735	611	188	735	NA
1978	144344	110	28090	9201	175	277	1098	NA
1979	75049	NA	18157	5705	360	29	2676	NA
1980	43172	30	7718	2737	180	236	992	NA
1981	44060	NA	4570	3120	NA	48	496	NA
1982	27372	NA	1972	1765	NA	59	399	NA
1983	21943	NA	1616	1353	NA	5	90	NA

[a] NA = Not applicable or unavailable.

Source: ATP, unpublished records.

represented by imports fell from 29.8 x 10^6 m^3 in 1973 to 24.3 x 10^6 m^3 in 1975. Production picked up again at ATP in 1976, reaching in all-time high of 191,626 m^3 in 1977, a record year of demand for timber. Since then production levels have been on the decline, especially since 1979, when there was a precipitous drop reaching a low level of 21,943 m^3 in 1983.

Between 1972 and 1976, MTC's log production averaged about 100,000 m^3 per annum (Table 3). From then, production increased gradually to 120,383 m^3 in 1978, but declined between 1979 and 1982 to 65,713 m^3. This was partly due to a government decision to transfer a substantial part of MTC's concession to some private Ghanaian individuals and companies. Part of these concessions was restored to MTC in 1982 and accounts for some of the rise in its log production level to 100,000 m^3 in 1984. It can therefore be said that, unlike ATP, MTC has generally been able to maintain log production at appreciable levels since nationalization even in the face of the ban imposed on the export of 14 primary species in 1980.

Square Logs and Lumber

Square log production has not been a major line at ATP since government participation in 1973. There is very little point in using sawmill facilities for a process that adds very little value to the log unless the company has another sawmill offshore where further processing into lumber is intended. In a sense, this was surely a positive impact of government participation in the company and subsequent nationalization.

The production of lumber closely follows that of logs. At ATP, apart from logs sold as final products, in the round or square form, the only timber that does not go through the lumber production stage are logs for the plymill. Until 1975, the plymill used about a quarter of ATP's log production; after that time, plywood production dropped significantly (Table 2) and its log intake decreased correspondingly. The annual lumber output was highest in 1970 at 60,208 m^3. Between 1971 and 1974 the level of output was maintained at about

Table 3. MTC production by type of commodity, 1972-84.

Year	Logs (m^3)	Lumber (m^3)	Veneer (m^2)	Profile boards (m^3)
1972	85831	40003	-	200
1973	111856	44972	-	200
1974	90949	28576	-	200
1975	116320	40376	-	200
1976	105319	47390	-	200
1977	114480	45242	-	1355
1978	120283	38246	-	1354
1979	95526	30046	-	1245
1980	90818	32355	560	1245
1981	79739	29280	1364	1479
1982	65713	26151	1047	1636
1983	88200	23697	1950	1615
1984	100200	31043	1074	1374

Source: MTC, unpublished records.

53,000 m^3. A sharp decline occurred in 1975, but there was partial recovery in the next few years before another downturn that reduced lumber production to a mere 1616 m^3 in 1983.

At MTC, the production of lumber is the most significant indicator of production performance because it constitutes, in terms of value, the company's major product line. The other two lines depend on the sawmill, especially profile boards (building panels).

There was a decline after nationalization in the output of lumber from a pre-1978 annual average of 41,000 m^3 to under 29,000 m^3 thereafter. If account is taken of the lumber that goes into the production of profile boards, the output of the sawmill since nationalization averages around 30,000 m^3 or 76% of the prenationalization level. In an economy where, between 1980 and 1983, 30% capacity utilization put a company above the national average, the achievement of MTC in lumber production has been quite satisfactory. Moreover, the decline in lumber production followed log production as explained above.

It is significant to note that, in the first half of the 1970s, ATP exceeded the rated capacity of its sawmill; MTC, however, never exceeded its rated capacity (Table 4). UAC was therefore extracting logs at a faster rate and had to run the sawmill on multiple shifts to cope with log supply. As a result, machine and equipment life would be shortened and, unless an efficient maintenance and supplies backup was put in place, the factory would experience constant breakdowns. UAC was in a position to maintain the factory but any deterioration in this capability or lack of supply of spare parts after nationalization

Table 4. Capacity utilization of mills at ATP and MTC (%).[a]

	Sawmills		Plymill
Year	ATP	MTC	(ATP)
1970	125.4	-	114.2
1971	106.5	-	115.2
1972	114.5	83.3	115.6
1973	111.0	93.7	121.9
1974	113.1	59.5	108.1
1975	59.2	84.1	61.8
1976	81.9	98.7	67.5
1977	72.2	94.2	72.8
1978	58.5	79.7	76.7
1979	37.8	62.6	47.5
1980	16.1	67.4	22.8
1981	9.5	70.0	26.0
1982	4.1	54.5	14.7
1983	3.4	49.4	11.3
1984	NA[b]	64.7	NA

[a] The figures have been calculated using data from Tables 2 and 3 as a percentage of the rated capacity of 48,000 m^3 for both sawmills and 12,000 m^3 for the plymill at ATP.

[b] NA = not available.

would adversely affect production. This could partly account for the difference in the rate of decline in lumber production at ATP and MTC after 1978. Even though both companies experienced decline in output, not unrelated to the general national economic malaise, MTC lumber production never fell below 50% of its peak output of 47,390 m^3 between 1972 and 1983. However, in 1983, ATP's 1616 m^3 was less than 3% of the 54,978 m^3 achieved in 1972.

Plywood and Veneer

Plywood is produced only at ATP where no veneer is sold as a final product. On the other hand, since 1980, MTC has been producing veneer for export. A comparison of the two companies reveals significant technological information.

The production of plywood at ATP started to decline in 1975 when production was 7412 m^3 compared with the previous year's total of 12,976 m^3. The declining trend was briefly arrested until 1978 after which production dropped steeply to 5705 m^3 in 1979 and reached an all-time low of 1353 m^3 in 1983. One of the constraints on the production of plywood at the factory has been inadequate generation of steam from the powerhouse. But the main point of comparison is that ATP had not considered the alternative of exporting its veneer. On all three visits to the factory, there was a stock of veneer that could not be made into plywood because of lack of glue, a faulty pressor or sander, or lack of steam. Export of the veneer would involve some slight modification in the system, however, because low-grade veneer used for plywood may not pass export standards.

In the case of MTC, where production of veneer is a postnationalization achievement, the company has been able to sustain production largely because of an agreement with a German firm that financed the equipment. While payment is being made through export of veneer to the German company, the foreign company is interested in maintaining a functional line by continuing to provide inputs.

Other Products

Box wood, black board, and finger flooring production had stopped at ATP by mid-1983 when the company was last visited by the research team (Table 2). The system building line, which was installed just before nationalization, had also become nonfunctional at the end of 1983. It was quite clear that the company had not been able to sustain its high value added lines. Even the level of production of lumber, we noted, had fallen to such a low level that the company could be said to be financially nonviable at the end of 1983.

At MTC the story once again is different. Not only has veneer production increased since its introduction after nationalization, but the profile board line expanded output greatly from 200 m^3 before 1977 to an average annual production of over 1400 m^3 between 1977 and 1984 (Table 3).

There is an important distinction which the names "system building" at ATP and "profile boards" at MTC conceal. Both are prefabricated building components. Both require drying to ensure that the products maintain their shape after production. But, while MTC profile boards are simple panels edged to enable easy joining, ATP produces all components needed to assemble a complete dwelling place, including wood for roofing. In other words, ATP's components involve much higher technology in terms of shaping and seasoning of products to withstand the vagaries of the weather. The point that emerges, as in the case of veneer and plywood, is that ATP was technologically more advanced than MTC before government participation and takeover.

Capacity Utilization

Implicit in the levels of production, assuming no change in installed capacity, are the levels of capacity utilization in the companies. In the absence of original documents, it was not easy to establish the rated capacities of the various production lines. The sawmills were established in the late 1940s. Since then new lines and individual machines have been added mainly at MTC. Much of what follows in terms of factory capacities is, therefore, only a rough guide. Capacity of logging is even more difficult to estimate and it is better to use historical averages rather than installed capacity as a measure of what can be achieved (TIHOC 1981; UAC 1981).

The sawmill at ATP is estimated to have an annual capacity of 48,000 m^3 with a log input of 120,000 m^3. This implies a conversion rate of 40% on the average. The plymill, on the other hand, has an annual rated capacity of 12,000 m^3 at 34% conversion rate. From higher levels achieved in the early 1970s (Table 2) when multiple shifts were run, we infer that the above capacities relate to one shift a day. In any case, once a common denominator is used the relative annual performance remains unaffected.

Table 4 presents information on capacity utilization for ATP's sawmill (lumber production) and plymill for which we could estimate rated capacities. The picture that emerges from these lines is duplicated at a worse level on the other production lines which had ground to a halt by 1983.

Table 4 indicates that capacity utilization in excess of 100% (based on one shift) was achieved in both the sawmill and the plymill at ATP until the end of 1974. In other words, the foreign owners operated the mills at maximum capacity when they had 100% ownership. The high level of production was maintained for the following 2 years, a factor that is consistent with forward planning and meeting contractual obligations. The year 1975, however, witnessed a sharp drop in capacity utilization in response to international market trends. Production levels and hence capacity utilization started to pick up in 1976 but a sharp and consistent decline resumed from 1977 at the sawmill and 1978 at the plymill. By 1983 the sawmill and plymill were operating at abysmal levels of 3.4 and 11.3%, respectively, of their rated one-shift capacities.

The sawmill at MTC coincidentally also has a rated capacity of 48,000 m^3 running on one shift of 8 hours. Its average annual capacity utilization since 1978 is 64% compared to 86% before then (Table 4).

The capacity of the profile board plant was calculated from that of its three drying kilns of 50 m^3 each. On that basis, the profile board line was operating at less than 50% of its capacity in 1983. That is, however, a marked improvement on the less than 10% capacity utilization before 1977.

The veneer mill, on the other hand, has a rated capacity of 15,000 m^2 of veneer a day working on one shift of 8 hours. As of January 1985, actual daily production was estimated at 7000 m^2 (47% capacity utilization), largely because of lack of the preferred wood. Because the mill produces solely for the overseas market, it produces to meet demand specifications.

In summary, MTC may be observed to have experienced a decline in its log and lumber production since nationalization, but the rate of decline has not been as sharp as that of ATP. With regard to the decline in lumber production, the trend may be partially attributed to the introduction of veneer production which takes a share of round logs. The company is generally operating at more than half of its total rated capacity.

Conversion Rates and Productivity

Serious gaps exist in the basic data on such important issues as fixed assets and profitability at ATP. It is, therefore, difficult to undertake accurate calculation of labour efficiency (according to production lines) and productivity compared to capital investment. Also, the employment data are aggregate for all the mills. It is quite clear, however, that with declining production levels coupled with marginal changes in total employment, production efficiency worsened. A major composite index of productivity in timber mills is recovery rate or the rate of conversion of raw timber into final products. Information gathered from ATP (Nigeria) Limited, indicates that conversion rates of about 35% for a plymill and 40% for a sawmill are average in the industry even though rates in excess of 50% are attainable, depending on the species being processed. It was noted above that ATP's plymill was established with a capacity of 12,000 m^3 at 34% conversion rate while the target conversion rate for the sawmill was 40%. That these rates could be improved upon is evident from the 1975 and 1976 conversion rates attained at both mills and presented in Tables 5 and 6.

Table 5. Sawmill output, conversion rates, and unit costs at ATP, 1975-84.[a]

Year	Input (m^3)	Output (m^3)	Conversion rate (%)	Unit cost (GHC/m^3)
1975	NA[b]	29105	42.0	109.2
1976	NA	39600	42.9	122.8
1977	NA	34847	36.5	123.5
1978	NA	28200	28.0	269.6
1979	NA	18157	28.0	505.3
1980	33050	7718	23.4	NA
1981	33244	4570	13.7	NA
1982	21427	1972	9.2	NA
1983	16588	1616	9.7	NA
1984	13350	2100	15.7	NA

[a] Annual figures are calculated from October to September.
[b] NA, not available.
Sources: ATP, unpublished records and UAC (1981).

Table 6. Plymill output, conversion rates, and unit costs at ATP, 1975–84.[a]

Year	Input (m^3)	Output (m^3)	Conversion rate (%)	Unit cost (GHC/m^3)
1975	NA[b]	7415	34.3	207.4
1976	NA	8100	32.8	238.6
1977	NA	8735	30.2	226.6
1978	NA	9201	28.0	265.7
1979	NA	5705	28.0	845.2
1980	10272	2820	27.5	NA
1981	11787	3120	26.5	NA
1982	5996	1756	29.4	NA
1983	5259	1335	25.4	NA
1984	5000	1224	24.5	NA

[a] Annual figures are calculated from October to September.
[b] NA, not available.
Sources: ATP, unpublished records and UAC (1981).

The tables indicate that the declining production levels were accompanied by declining recovery rates and increasing cost per unit in both the plymill and sawmill. From a conversion rate of 34.3% at the plymill in 1975, the rate fell to 26.5% in 1981, recovered marginally in 1982, only to fall again thereafter. The situation at the sawmill is even more disappointing. From a conversion rate of 42% in 1975, only 9.2% was achieved in 1982. Declining productivity rates were accompanied by rising cost per unit of output. The cost of producing a cubic metre of plywood rose from GHC 207.4 in 1975 to GHC 845.2 in 1979. In the sawmill, wood costing GHC 109.2 to produce in 1975 rose to GHC 505.9 in 1979, a fivefold increase during the period of review. Part of the cost increase is attributable to inflation (see Table 9).

A contributory factor to the declining recovery rate at the sawmill is the fact that more and more secondary species are being extracted. Also, good marketable wood is fed to the steam boiler furnaces to supply adequate power because insufficient sawdust is being generated at the low levels of production. The ATP factory was designed to depend on sawdust fueled power generators. At normal production levels, about 50%, enough sawdust is produced to power the generators. At lower operational levels, the whole energy supply to the factories, including steam for drying veneer in the plymill and power for domestic use, is jeopardized. To keep essential facilities running, including the company hospital, the boiler is fed with wood that would otherwise be used for lumber with the consequence that recovery rates drop significantly. However, because there was also a decline in the plymill conversion rate, a fundamental weakening in technical efficiency is indicated. This may be attributable to a combination of factors including maintenance of machinery and equipment and quality of labour. These are taken up in chapter 9 where technological capacity in the firms is discussed. Here, our major concern is to identify trends in production and productivity.

The major indicator of MTC efficiency is recovery rate of the sawmill (Table 7). MTC recovery rates are within the industry's

Table 7. Recovery rates at the MTC sawmill, 1972-83.

Year	Log input (m^3)	Output (m^3)	Gross conversion rate (%)
1972	67712	40003	59
1973	76351	44972	59
1974	55559	28972	51
1975	79834	40373	51
1976	83328	47390	57
1977	99566	45242	45
1978	86125	38246	44
1979	83714	36047	43
1980	69434	31534	45
1981	63135	29281	46
1982	59080	26152	44
1983	65022	28991	45

Source: MTC, unpublished records.

average, but there has been some decline in its previously high rate of 59.1% in 1972 to 43-45% since 1977. This is due partly to the use of secondary species which is increasing in the face of primary species decline. Generally, however, MTC has maintained average conversion rates within the high range of the industry. Average conversion rates of 39% and 41% for veneer and the profile boards, respectively, are also at acceptable levels for those lines.

Conclusion

The scale of operation at ATP, in terms of total output as well as range of products, was bigger than at MTC at the time of nationalization. ATP also had a bigger concession with a higher density of timber than MTC. Besides lumber and plywood, ATP also produced black board, finger flooring parquet, systems building components, and box wood. The company has not introduced any new line since nationalization. Instead, it discontinued all lines except lumber and plywood and, by 1983, even these were grinding to a halt. On the other hand, MTC had only two lines of production before nationalization - lumber and profile board. It has added veneer production since then. The company has maintained production levels above 50% of rated capacities even during the period of general decline (1977-83) and, since 1984, has started to increase production levels. Examination of conversion rate, an important composite index of efficiency, shows that MTC managed to maintain higher than industry-average conversion rates in Ghana while ATP's rates dropped significantly.

FINANCIAL PERFORMANCE

6

In chapter 5, the performance of African Timber and Plywood Limited (ATP) and Mim Timber Company Limited (MTC) was reviewed in terms of physical output, the rate of conversion of logs to processed products, and utilization of installed capacities. In business, however, technical efficiency is only a means to an end. For the survival of the company, output performance must be converted into financial profitability which requires marketing success. This chapter continues the assessment of the two companies from the point of view of sales, market shares, and profitability.

Sales and Market Shares

The timber companies may sell their products on the local Ghanaian market or export them to overseas markets. The latter measures their foreign exchange earning capacity which, in Ghana, is an important determinant of the amount of foreign exchange the company is allowed for servicing external debts and importing vital inputs. Thus, the distribution of output between exports and domestic sales is as important as the total volume of sales achieved each year. Moreover, exporting involves greater marketing skill than selling to domestic consumers who, in the sellers' market that prevailed in the 1970s in Ghana, came to the producers rather than vice versa.

ATP

Volume of total sales follows output closely even though there may be a lag of several months between production and sales especially in the case of exports. From Table 8, ATP's total sales dropped precipitously from 68,317 m^3 in 1973 to 5119 m^3 (7.5% of the 1973 level) in 1983. Even excluding the exceptionally high sales volume of 1973, annual sales were above 30,000 m^3 until 1979, fell more than 50% to 14,187 m^3 in 1980, then to 6455 m^3 the following year. Another significant trend in ATP sales performance was the switch from exports to local sales. Before nationalization, UAC sold almost all its products overseas; local sales before 1976 averaged less than 30% of total output. This position has, however, reversed since then resulting in sharp deterioration of ATP's export performance. In fact, from 1981 to 1983 ATP virtually ceased to export its products.

The value of sales (Table 8) reveals important trends both at ATP and in the Ghanaian economy as a whole. Although total value of sales increased, the unit price of wood increased even more. For example, the value of 1983 sales was 62% higher than that of the much higher volume of sales in 1973. A look at local and export sales values reveals that while there was a sharp increase in the unit value of local sales, that of export sales (generally high value-added

Table 8. ATP's exports and local sales, 1973–84.

Year	Local sales		Exports		Total	
	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)
1973	13399	958009	54918	7712312	68317	8670321
1974	14677	1226536	32954	7220206	47631	8446742
1975	14544	2107222	29799	5023219	44343	7130441
1976	9862	1312817	29156	4704186	39018	6017003
1977	22707	7583934	16570	3625404	39277	11209338
1978	23028	6597909	16675	4728478	39703	11326384
1979	22226	9976077	8877	5337071	31103	15313148
1980	11275	8558824	2912	1919364	14187	10478188
1981	6064	18317781	91	108316	6455	18426097
1982	6090	13588017	746	231557	6839	13819574
1983	5108	13998464	11	11131	5119	14009595

Source: ATP, unpublished records.

products) remained fairly stable. Disregarding, for the moment, product composition of sales, the value of an average unit (m^3) sold locally was GHC 71.50 in 1973, GHC 286.52 in 1978, and GHC 2740.50 in 1983. The corresponding unit values for exports were GHC 140.43, GHC 283.57, and GHC 1011.98. Generally, the companies export the better quality products. The disparity between domestic and export unit prices is accounted for by domestic inflation and maintenance of overvalued currency in the economy. Table 9 indicates that double-digit, and even three-digit, inflation rates were maintained in Ghana. At the same time, the cedi remained at GHC 1.15 to USD 1.00 between 1973 and 1977, devalued to GHC 2.75 to the dollar over 1978-82, and it was only in late 1983 that a major devaluation was undertaken which brought the currency equivalent to GHC 30.00 to USD 1.00. Since then, successive devaluations have been undertaken to the extent that in June 1986 the dollar was GHC 90.00 and there was every indication that the cedi was still overvalued because the black market rate was about GHC 180-200 to the dollar. It seems that ATP shifted the reduced output in the later years from exports to the domestic market to take advantage of higher domestic prices.

Not only did the company perform badly in absolute terms on the world market, but its share of total Ghanaian exports also dropped considerably. Table 10 presents information on the volume of exports of four leading (nationalized) timber companies from 1977 to 1982. Over that period, ATP's share of total national exports dropped from 3.3% to a meagre 0.7%.

A detailed examination of the composition of ATP's sales (Table 11) shows that after nationalization, the company increased its local sale of plywood reaching 8205 m^3 in 1978. The local market is less discriminating as to the quality of plywood and inflationary prices enabled the company to earn substantial revenues. However, the general decline in output affected plywood as well as lumber, the two principal product lines. Even though local sales of plywood continued until late 1984, the fall in annual sales from over 8000 m^3 in 1977-78

Table 9. Annual rates of inflation for Ghana, 1961-83.[a]

Year	Inflation rate (%)	Year	Inflation rate (%)
1961	3.57	1973	17.51
1962	1.72	1974	18.36
1963	6.78	1975	29.69
1964	9.62	1976	56.35
1965	26.40	1977	116.25
1966	13.28	1978	73.30
1967	-8.98	1979	54.24
1968	8.78	1980	49.72
1969	7.13	1981	117.07
1970	3.86	1982	22.30
1971	9.28	1983	122.84
1972	10.05		

[a] 1961-63 are implicit inflation rates in GDP deflator; 1964-83 are implicit inflation rates in national consumer price index.

Source: Huq (1987).

Table 10. Volume of exports of nationalized timber companies, 1977-82.

Year	MTC		Gliksten		ATP		TVLC		Total of companies		National total (m^3)
	Volume (m^3)	% of national total	Volume (m^3)	% of national total	Volume (m^3)	% of national total	Volume (m^3)	% of national total	Volume (m^3)	% of national total	
1977	51085	10.3	21525	4.3	16504	3.3	7102	1.4	95943	19.3	497326
1978	59037	15.0	18214	4.6	14757	3.7	4325	1.1	96333	24.4	394370
1979	39540	14.0	7030	2.5	9181	3.2	2912	1.0	58663	20.7	283363
1980	34730	18.0	3276	1.7	2909	1.5	458	0.2	41373	21.5	192490
1981	23360	20.0	778	0.7	42	0.4	1452	1.2	25632	21.9	116722
1982	10156	10.3	356	0.4	741	0.7	517	0.5	11770	11.9	98712

Sources: Figures for MTC, Gliksten, and TVLC were obtained from Ghana Timber Marketing Board (1983) and TIHOC (1981). Figures for ATC were obtained from the company itself in 1983.

Table 11. Volume and value of ATP's local sales by type of commodity, 1973-83.

Year	Total	Round logs	Lumber	Plywood	Black board	Finger flooring	System building	Others
Volume of sales (m^3)								
1973	13394	-	11730	1669	-	-	-	1
1974	14677	-	13265	1412	154	-	-	61
1975	14544	-	9394	5150	125	-	-	-
1976	9862	-	7009	2853	-	-	-	-
1977	22707	519	12916	8061	109	128	735	81
1978	23028	365	11796	8205	69	158	1098	932
1979	22226	1356	8544	5832	125	-	2676	921
1980	11275	2640	3764	3282	79	211	992	305
1981	6364	-	2380	3099	-	-	496	380
1982	6090	3117	950	1752	-	59	(10)	382
1983	5108	2925	920	1216	-	5	-	-
Value of sales (GHC)								
1973	958009	-	769618	188391	-	-	-	7595
1974	1226536	-	957453	250817	18266	-	-	62883
1975	2107222	-	777398	1312465	17359	-	-	-
1976	1312817	-	507487	805330	-	-	-	-
1977	7583934	39831	1949282	5111301	46371	58040	331614	89690
1978	6597909	7728	2477955	3282000	35150	99963	290321	281157
1979	9976077	96120	2059440	6362088	50583	-	979753	323998
1980	8558824	515853	1784585	5037928	49348	108491	637585	425030
1981	18317781	-	1822160	14101830	-	-	548922	3036996
1982	13588017	851144	1559107	10493403	-	88220	17630	2311486
1983	13998464	492029	2051520	11261817	-	32302	-	-

Source: ATP, unpublished records obtained in January 1985.

Table 12. Volume and value of ATP's export sales by type of commodity, 1973-83.

Year	Total	Round logs	Square logs	Lumber	Plywood	Black board	Finger flooring
Volume of sales (m^3)							
1973	54918	6009	671	29891	12964	2211	3172
1974	32954	-	34	23555	4387	1242	3736
1975	29799	4927	317	13057	7903	925	2670
1976	29156	2271	-	22665	3775	-	405
1977	16570	3396	229	12035	286	502	60
1978	16675	3718	58	12322	312	106	119
1979	8877	2136	44	6104	318	235	29
1980	2912	1309	-	1064	416	101	25
1981	11	-	-	43	-	-	48
1982	746	656	-	61	26	-	-
1983	11	-	-	-	11	-	-
Value of sales (GHC)							
1973	7712312	355304	32334	3414458	3324362	219805	266049
1974	7220206	-	4860	4379410	2054794	346120	387712
1975	5023219	417717	39141	1728247	2948353	187953	301809
1976	4704186	358111	-	3234631	1272187	-	161557
1977	3625404	690272	40241	2575122	105819	111000	29443
1978	4728475	1087800	28223	3271087	175607	33739	56443
1979	5337071	852632	29863	3877613	337060	165816	37193
1980	1919364	361918	-	848324	595319	80823	32980
1981	108316	-	-	39566	-	-	68750
1982	231557	139972	-	57586	31491	-	-
1983	11132	-	-	-	11132	-	-

Source: ATP, unpublished records obtained in January 1985.

to a mere 1216 m^3 in 1983 is a very poor performance. In the case of lumber too, local sales dropped significantly after 1978. This indicates that the sawmill, which converts logs into lumber, was in a poor state. With respect to the other processed products, namely black board, finger flooring, and system building, there was virtually no production in 1983. Instead, we find that the sale of round logs (unprocessed wood from the forest), which was almost nonexistent before nationalization, increased considerably reaching 3117 m^3 in 1982. In fact, in 1982 and 1983 the volume of unprocessed timber sold locally exceeded that of all processed products combined, an important indication of deterioration in technical capabilities.

The increase in local sales of plywood is reflected in a corresponding reduction in exports after 1976 (Table 12). The relatively higher domestic prices for plywood, along with the need to meet stringent export standards, combined to produce a situation where ATP opted out of the export market for plywood, black board, and finger flooring. Building components, which came on line after nationalization, never reached the export market. Export of round logs and some square logs continued until after 1980 when the government banned the export of 14 major species of wood in log form from Ghana.

To sum up the situation before nationalization, ATP was a production centre responding to market plans and schedules set in London. Since 1978, over 75% of its products have found their way into the local market. Far from being commendable, this domestic-oriented production policy was partly the result of lack of technological capacity. Other factors which contributed to the inability to sustain the export market include the high inflationary prices on the local market and rigorous international quality specifications compared to the local market.

MTC

Mim Timber Company shares some of the characteristics of ATP with respect to trends in sales. The proportion of output sold on the local market increased, especially in the early 1980s (Table 13), and local sales reached GHC 40,207,133 in 1983. However, MTC was able to maintain export levels and, in fact, increased export sales from an average of 35,000 m^3 per annum from 1972 to 1976 to about 41,000 m^3 in the following 4 years. Since 1981, export sales declined to a low level of 11,353 m^3 in 1982 before they began to pick up in late 1983 as a result of sharp depreciation of the Ghanaian currency. MTC, thus, followed ATP in increasing local sales to enjoy inflationary local prices and cutting export sales to survive. But in general the company was able to sustain total production above 28,000 m^3 (58% of rated capacity) maintaining its capability to respond to favourable external and domestic market conditions in 1984 when successive devaluations raised the exchange rate from GHC 2.75 to a dollar (U.S.) to GHC 50 to a dollar. In 1984, as much as 74.5% of total sales came from exports (Table 13). Tables 14 and 15 provide details of the composition of local and export sales, respectively. It seems export sales were strengthened by sale of high value-added products, namely profile boards and veneer, the latter having come on line in 1980.

Profitability

The ultimate objective of a company from the short-term, commercial point of view is profitability. For state-owned enterprises the

Table 13. Volume and value of MTC's exports and local sales, 1972-84.

Year	Local sales		Exports		Total	
	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)
1972	821	1165878	41739	6192595	42560	7358473
1973	1309	4395279	34354	7523652	35663	11918931
1974	1596	1928451	28832	9284120	30428	11212571
1975	6363	1223084	31693	6937251	38056	8160335
1976	14424	1372137	39368	14222573	53792	25594710
1977	2971	1966462	36680	15341464	39651	17307926
1978	10429	2962097	52356	29521434	62785	35483531
1979	6389	2736757	41889	33077026	48278	35813783
1980	11105	6271651	34289	33313599	45394	39585250
1981	10643	23071787	18017	19958835	28660	42976622
1982	17935	18569241	11353	10149357	29288	28718598
1983	16340	40207133	12379	48102997	28719	88310130
1984	-	60193000	15783	159400000	-	219593000

Source: MTC, unpublished records.

profit motive may be traded off for other objectives such as benefits to the community or the acquisition of technological capacity.

ATP

The financial performance of ATP has been poor to say the least. Although total sales figures have increased since nationalization in 1976, they have not been commensurate with the double- and triple-digit inflationary rates in Ghana over the same period. Production cost per unit sale, which showed a declining trend between 1971 and 1974, began to rise thereafter (Tables 5 and 6). With the exception of a meagre profit in 1977, the company has been operating at a loss since 1975 (Table 16). For some years, the net loss exceeds gross loss as shown on the table because Ghana levies a turnover tax irrespective of profit margin.

The sales trend does not reflect the real financial position at ATP. Since 1978, the company has been depending on banks and the government to finance recurrent expenditures such as wages and salaries. Income tax, sales tax, and social security contributions for workers have been outstanding for many years. The company owes large sums of money to its creditors, including the government which has channeled money to the company in the form of loans. Customers who have paid advances to be supplied with some of the company's products have now become creditors. At the end of 1984, the company's indebtedness totaled GHC 128.6 million (Table 17). As of January 1985, workers of the company had not received salaries or wages for the previous 5 months.

The gravity of the company's financial position is further amplified if one considers the fact that its total assets (fixed assets plus stocks and stores) stand at GHC 27.1 million. The situation makes it abundantly clear that ATP has become a liability to the economy of Ghana.

Table 14. MTC's local sales by type of commodity, 1972-83.

	Logs		Lumber		Profile boards		Veneer		Total	
Year	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)
1972	292	826366	529	339512	-	-	-	-	831	1165878
1973	685	3927066	624	468213	-	-	-	-	1309	4395279
1974	738	1518153	858	410298	-	-	-	-	1596	1928451
1975	315	782394	6048	440690	-	-	-	-	6363	1223084
1976	63	325860	14361	1046277	-	-	-	-	14424	1372137
1977	84	480783	2887	1485679	-	-	-	-	2971	1966462
1978	2227	388876	8202	2573221	-	-	-	-	10429	2962097
1979	-	-	6389	2736757	-	-	-	-	6389	2736757
1980	5869	1752783	5236	4518868	-	-	-	-	11105	6271651
1981	1066	5526851	8347	12381180	855	3371431	375	1792325	10643	23071787
1982	7071	3059299	9196	13597030	1154	614236	514	1298676	17935	18569241
1983	7575	9363921	7345	23093506	710	4305733	710	3443973	16340	40207133

Source: MTC, unpublished records.

Table 15. MTC's exports by type of commodity, 1972-83.

Year	Sawn timber		Logs		Profile boards		Veneer		Total	
	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)	Volume (m^3)	Value (GHC)
1972	28703	4106009	13036	2086586	-	-	-	-	41739	6192595
1973	32499	7371230	1855	152422	-	-	-	-	34354	7523652
1974	16806	4948817	12026	4335303	-	-	-	-	28832	9284120
1975	31693	6937251	-	-	-	-	-	-	31693	6937251
1976	31380	9987854	7988	4234719	-	-	-	-	39368	14222573
1977	30641	12363116	6039	2978348	-	-	-	-	36680	15341464
1978	28349	20300997	23770	8624716	235	595721	-	-	52356	29521434
1979	23759	27008387	17423	4794932	707	1273707	-	-	41889	33077026
1980	18528	26120750	14532	5135644	652	1259262	577	797943	34289	33313599
1981	12504	16388524	4318	1400034	287	1154916	908	1015361	18017	19958835
1982	7359	8435860	3011	571866	500	612304	483	529327	11353	10149357
1983	10708	43296068	937	1256025	443	1426918	291	2123986	12379	48102997

Source: MTC, unpublished records.

Table 16. Financial performance of ATP, 1970-83.

Year	Total sales (GHC)	Production cost (GHC)	Profit (GHC)		Production cost : sales ratio
			Gross	Net	
1970	5633833	4689137	801000	540000	0.83[a]
1971	5251000	4806132	357000	58000	0.92[a]
1972	7676000	4793000	2612000	1348000	0.62
1973	8827839	5464000	2059000	982000	0.62
1974	8657181	4793000	1463000	622000	0.55
1975	8289757	6333000	-606000	-892000	0.76
1976	8081256	7382000	-2180000	-2334000	0.91
1977	11229430	8561000	211000	63000	0.76
1978	13232473	11406000	-329000	-813000	0.86
1979	17331307	12270000	-4215000	-4699000	0.77
1980	7294746	19126881[b]	-11832135	NA[c]	NA
1981	19986206	24929050[b]	-4942844	NA	NA
1982	15865077	26410589[b]	-10545512	NA	NA
1983	15420545	29634676[b]	-14214131	NA	NA
1984	34502640	39757100[b]	-5254460	NA	NA

[a] The high ratios for 1970 and 1971 could not be satisfactorily explained.

[b] These figures refer to the company's total expenditure, i.e. production cost plus other operating expenses.

[c] NA, not available.

Source: African Timber and Plywood (Ghana) Ltd., unpublished records.

Table 17. Total indebtedness of ATP at the end of 1984.

Type of debt	Amount (GHC)
Overdraft	15755103
Income tax outstanding	5645246
Ghana government loan	20879737
Social security contribution outstanding	12651345
Sales tax outstanding	18590475
Other creditors	55029439
Total debt	128551345

Source: ATP, unpublished records.

Table 18. MTC's financial performance, 1972–84.

Year	Fixed assets (GHC)	Total sales (GHC)	Cost of production (GHC)	Gross profit (GHC)	Other income (GHC)	Other costs (GHC)	Tax (GHC)	Net profit (GHC)
1972	949618	7056290	5103764	1952526	65919	1289112	480000	249333
1973	1229633	12051227	5786219	6265008	139315	1718295	2620000	2066028
1974	2297328	8032969	5131110	2901859	137359	2145322	825000	68896
1975	2040598	12092830	6382178	5710652	129491	2754564	1900000	185579
1976	3898190	16367004	7455563	8911441	327404	3778578	1896075	3564192
1977	4936331	17320820	9098270	8222550	363619	4830383	2103508	1682278
1978	11696515	33559129	14276587	10282542	544620	6889069	9382216	3555878
1979	10394055	36718441	23790217	12928224	1744072	8375103	4980000	1636106
1980	9239346	43392624	27066785	16325839	3419541	14139004	3970270	4836106
1981	7904779	47944355	32665080	15279275	5065964	13664941	1844038	4836260
1982	6539918	31544029	26101813	5422216	7624635	12810649	687627	-431425
1983	45462236	130053020	66010394	64042626	10108288	46663928	5970184	21516802
1984	NA[a]	219593255	138573000	81020155	10108000	72194000	7500000	11434155

[a] NA, not available.

Source: MTC, unpublished records.

MTC

An examination of the overall financial performance of MTC over the period 1972 to 1984 (Table 18) shows a remarkable achievement within rather harsh economic circumstances. The company made a gross profit before tax for each of the 13 years. This led to net profit in all years except 1982 in which the loss was due to a sharp fall in log output, low export prices, and gross overvaluation of the Ghanaian currency. Even then, no loss would have been incurred if not for the situation in Ghana whereby turnover tax is exacted even if no profits are made. This tax avoidance mechanism against underinvoicing and failure to declare true profits means that a company pays 2.5% turnover tax where taxable income falls below that.

Phenomenal increases in local operating costs, especially wages, due to adjustments in response to devaluations since 1983 have put severe liquidity strains on most production systems in Ghana resulting in heavy dependence on bank overdrafts. MTC has not been an exception, but the company has been able to operate with minimal indebtedness.

As of January 1985, the company's total indebtedness amounted to GHC 23.3 million in medium-term foreign loans for the acquisition of the veneer mill and other capital equipment. This is being paid from the company's export sales and allowable 20% retention from its exports in foreign exchange.

Conclusion

Review of the marketing and financial performance of ATP and MTC has revealed both similarities and significant differences. Both companies started from a position where the bulk of their output was being exported. In the face of severe economic constraints, especially that of currency overvaluation and high domestic inflation, both companies sold increasing proportions of their output domestically, while overall volume of sales followed declining production trends especially in the 1980s. But, although ATP virutally lost its capacity to operate as a viable concern, MTC was able to operate at all times above 50% of the rated capacity of the sawmill. At the same time, MTC maintained a foothold in the export market. The export performance of ATP was poor, not only relative to MTC, but as Table 10 shows, also at the national level. The relative performance of the companies becomes even more clear when profitability is considered. While ATP has been a financial drain on the national economy, MTC remains a profitable concern.

Even if a nationalized company does not perform very well by commercial criteria, such as total output, productivity, profitability, and other technical efficiency indicators, it may enable the country to achieve other ends, such as the development of indigenous technological capabilities and employment of nationals at levels beyond those achieved in TNCs operating solely for profit. In this chapter, we examine issues pertaining to national control over the industry, employment of indigenous personnel, the impact of the operations of the companies on the immediate community such as the provision of health and other social services, conservation of natural resources, and utilization of local raw materials as opposed to dependence on imported inputs. Even though technological capacity is the focus of the study, it is important that evidence, however limited, concerning these other issues be presented. In view of the importance of employment to technological capacity, much attention is devoted to it in part III, but it is included in this chapter to reflect the sociopolitical importance given to it by governments.

Control of Firms

The explicit objective of Ghana's indigenization policies in the 1960s and early 70s was to transfer control of business to Ghanaians. Adei (1980: 27) is of the opinion that this was achieved in connection with small-scale businesses that were either confiscated or purchased over the 1968-71 period except on a few occasions where foreigners used Ghanaians as front men to cover their alien ownership. With respect to state majority participation in timber and mining companies as well as the widespread 40-60% indigenization of ownership in 1975, Adei is less certain about local control. "The representatives of the Ghanaian shareholders including the Government are either inexperienced or former employees of these very foreign companies. They are therefore not likely to have the technical competence to superintend the foreign management or may still keep their allegiance to the one time employers in the case of the latter" (Adei 1980: 27).

Although part ownership did not ensure national control over the industries, even though in the case of employment (see below) positive gains were made, nationalization did bring the companies under the control of the government. Control must be viewed from two angles. In the first place, there is control at the directorate level where the Board of Directors decides on the general direction the company must take. The ability to exercise these functions depends on the technical competence of the board members vis-à-vis the senior technical personnel of the company, represented on the board by the managing director. The second level of control has to do with the day-to-day management of the company: acquisition of inputs, production of goods, marketing, etc.

In the case of ATP, nationalization resulted in control at both levels of company management. All board members were Ghanaian, comprising mainly senior national employees of the company, civil servants, and a third category of people drawn from the timber industry in Ghana. Because UAC also withdrew its expatriate staff, all positions were filled by Ghanaians. It is argued in part III that the change resulted in a drop in the level of technical capability but the running of the company became fully the responsibility of Ghanaians.

The situation was different at MTC. Nationalization did result in the government having authority to appoint all the members of the Board of Directors as well as replacing expatriate staff. The expatriate staff, however, did not leave because they were hired individually by the company and, with the terms of their contracts not affected by change in ownership, most of them remained. In fact, for the best part of the period since nationalization, the positions of managing director and chief engineer have been held by expatriates. Thus, although control has passed to the government, there is still heavy dependence on expatriates for technical expertise. However, the essence of control is not who is employed but who decides who is to be employed and in that sense we conclude that the objective of control has been achieved.

Employment

Even though increasing the number of Ghanaian employees, especially at the high functional levels, was not made a specific target in the 1972 legislation on state participation in foreign enterprises (Ghana 1972a, b) or in the subsequent nationalization, one could assume it was included under the "controlling the commanding heights of the economy" criterion (chapter 1). In all companies in which the government acquired 55% share, the position of deputy managing director was indigenized immediately even though technical management, including the position of the managing director, remained with foreigners. Adei (1980: 26) notes that "the companies were made to adopt Ghanaianization of top level manpower and the result of this in the biggest company, Ashanti Goldfields Limited, shows a rapid fall in expatriates by 33.3% whilst the number of senior Ghanaian staff nearly doubled in five years. This trend had not prevailed before the Government participation in 1972." The employment of Ghanaians in ATP and MTC since nationalization is examined in the next two subsections.

ATP

The highest level of employment attained by ATP since 1972 was 2627 employees in 1976. Table 19 provides evidence of moderate increases in the level of employment after the government took majority shares while UAC managed the company. Despite sharp declines in production levels, the company continued to keep the number of employees above 2000 until 1982. It is significant to note, however, that a high rate of labour turnover was recorded, especially since the beginning of 1980, among the senior staff.

Much of the loss of employees during this period was in the professional, managerial, administrative, and technical categories.

Table 19. Analysis of ATP personnel by level of employment and by nationality, 1971-82.

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Level of employment												
Production staff (skilled and unskilled operatives)	886	698	939	946	937	994	977	868	904	838	803	510
Professional, managerial, and administrative staff	101	84	96	91	91	89	78	68	72	66	63	40
Technical, clerical, and other office staff	583	459	617	623	616	654	643	571	595	551	529	336
Other (unskilled)	792	625	840	947	838	890	875	777	810	750	719	456
Nationality												
Ghanaian	2331	1837	2470	2491	2465	2617	2572	2284	2381	2205	2114	1342
Expatriate	31	29	22	16	17	10	1	-	-	-	-	-
Total	2362	1866	2492	2507	2482	2627	2573	2284	2381	2205	2114	1342

Source: ATP, unpublished records.

The company was faced with a problem of losing its technical manpower. In 1982, the company had to reduce the number of employees by about 37%, from 2114 to 1342. Given the present capacity utilization of less than 10%, 1342 employees is still too many by over 50%. In fact, in 1983 when the factory was operating at 12% of its rated capacity, the managing director estimated the number of employees needed at only 400. The present problem of overstaffing of operatives is due to prenationalization expansion which resulted in the hiring of more employees. The dismal performance of the company has put the personnel at risk.

The overemployment situation at ATP is a major cause of the losses being incurred by the company. It has been paying GHC 1.2 million each month in wages and salaries alone and only GHC 600,000 for consumables such as lubricants. Unfortunately, the company by 1981 had lost about 55% of its technical personnel using 1971-76 average figures as a base. Most of the technical men left because of deterioration in working conditions. A contribution to that is the problem of frequent power cuts due to lack of wood to fire the boilers; sometimes the factory can shut down for up to 6 hours a day. The company cannot dispose of its excess labour because in Ghana it is illegal to dismiss more than 12 employees without official approval which, in most cases, is not forthcoming.

An important factor in the loss of senior and technical personnel at ATP relates to operation of UAC as a multinational company. On nationalization, all expatriate personnel left, being de facto employees of UAC not ATP. Some top Ghanaian employees also joined other UAC subsidiaries in the country and overseas. In fact, the three most senior Ghanaian technical personnel are working in other UAC establishments. The technological implications of this phenomenon are explored in later chapters.

Did nationalization result in greater employment opportunities for nationals at ATP? In the first place, with the departure of all expatriate staff in 1977, one may say that opportunity existed for the employment of high-level Ghanaian personnel. Whether the company has been successful in recruiting competent nationals will be discussed in part III under development of technological capacity. Between 1972 and 1976 when the state held majority shares but UAC, with 45% share, managed the company, the number of expatriate employees fell from 29 to 10 and even though the number of professional, managerial, and administrative staff did not increase significantly, the proportion of Ghanaians rose by almost the number of expatriates that left the company. On nationalization, UAC withdrew its expatriate staff but the company has not been able to sustain the number of high-level personnel even at the 1977 level of 78. By 1981, before the forced reduction of employment due to a very low operating level, the number of Ghanaian high-level personnel had fallen to 63. The picture emerging from Table 19 is that, although the government was able to get UAC management to employ more Ghanaians, both skilled and unskilled, when the company operated as a joint venture, the gains have been reversed since nationalization to the extent that all employees may be lost if the company collapses.

Although it is premature to draw far-reaching conclusions from a single case, the evidence points to the fact that employment is dependent on the ability of a nationalized company to maintain successful operations unless the state wants to pay unproductive employees for other noneconomic or social reasons.

MTC

MTC was employing 1894 people in 1977 when it was nationalized. This figure dropped to 1511 in 1981, but the situation has been reversed with 1983 and 1984 employment figures exceeding 2000, the highest in the 1972-84 period (Table 20).

More significant is the fact that the employees lost in the intervening years came largely from the unskilled (operative) category, with the company maintaining and even increasing the number in the professional, administrative, and managerial categories. In other words, the company has been able to keep its high-level Ghanaian personnel. Unfortunately, the situation has not been very good, because the company has been losing its trained, mid-level, technical personnel with considerable experience who are being replaced by newly graduated recruits from its training school.

The other significant factor about the employment situation at MTC is that the company has always maintained at least five expatriate engineers and other senior personnel. There is, however, a marked difference between 12-16 expatriates before nationalization and 5-7 after. Even under state ownership, the company has found the need to continue to engage expatriate personnel, but not on the same scale as before.

TNC Subsidiaries and Social Benefits

The mention of TNC subsidiaries immediately brings to mind enclave operations. It is important to stress that even though both companies were 100% subsidiaries of TNCs, neither falls into the typical enclave setting. ATP is a company whose operation is very integrated into the community in which it is sited. In fact, the whole township of Samreboi and its villages of about 10,000 inhabitants, a big community by Ghanaian standards, are built around the company. The company's operation has opened up an area of forest with a radius of about 32 km. The company's hospital serves the whole community. The district has become a leading food and cocoa producing area and these depend on the company's maintained road network. This is surely a case where the social benefits may far exceed any direct commercial gains in terms of taxes the TNC subsidiary paid to the government. MTC, to a limited extent, is in the same position. Even though in their case the main road linking Mim to Kumasi, the nearest railhead, was constructed by the government, the continued use of at least an 80-km stretch depends on maintenance by MTC.

The nationalization decision should have evaluated these social benefits of the companies. Already several hundreds of hectares of farm land are being rendered inaccessible by road due to ATP's inability to maintain them. Lack of appreciation for these external benefits associated with the operations of ATP and MTC means that the government did not take into account all the responsibilities involved in nationalizing the firms. A detailed study to quantify some of these external benefits, however, lies beyond the scope of this study. It is quite evident, however, that nationalization has reduced the social benefits rendered by ATP.

Table 20. Analysis of MTC personnel by level of employment and by nationality, 1972-84.

	1972	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Level of employment											
Paid production workers (skilled and semiskilled)	371	321	516	409	338	377	459	403	382	595	647
Unskilled operatives	1556	1476	1376	1405	1256	1237	1143	1033	906	1296	1243
Professional, administrative, and managerial staff	23	30	29	30	33	36	36	31	35	42	41
Technical, clerical, and other office workers	23	27	30	50	59	56	36	44	42	80	98
Nationality											
Ghanaian	1957	1840	1739	1887	1679	1695	1668	1506	1360	2006	2022
Expatriate	16	14	12	7	7	6	6	5	5	7	7
Total	1973	1854	1751	1894	1686	1701	1674	1511	1365	2013	2029

Source: MTC, unpublished records.

Resource Conservation and Use of Local Inputs

The scope of reducing imported inputs in the timber industry is limited in view of the rudimentary stage of the capital goods industry in the country. Almost all plant and machinery are imported, with differences being determined by the scale of operations rather than ownership. Besides plant and equipment, the major input is local timber. However, in the case of plymilling at ATP, a sizeable amount of glue is imported; since nationalization, efforts to develop local substitutes have so far met with little success. This effort to develop a local substitute for imported glue was the result of the company's inability to generate sufficient foreign exchange to acquire inputs.

Another area where savings could be made on imports is fuel for generating electricity and steam. Both ATP and MTC are situated in areas outside the national electricity grid. They have to generate their own power, using oil-fired generators or wood-fired boilers. ATP was built to use only wood-fired boilers and hence does not use oil other than lubricants, petrol, and diesel fuel for vehicles and servicing factory machinery. But, because of low production levels and resultant inadequacy of industrial wood waste, the management wants to install oil-fired generators, a move which has so far been frustrated by financial constraints. That would be a reversal of the company's dependence on local raw materials. MTC, on the other hand, has both oil-fired generators (first to be installed) and wood furnaces. At the time of my visit in 1983-84, the company used the oil generators as a stand-by facility, depending on the furnace which was adequately supplied with wood waste from the sawmills. The decision to install a wood-fired furnace at MTC was activated by the oil price increases of the 1970s and problems of supply of petroleum products in the country. Moreover the decision was not the result of nationalization; it was a decision undertaken earlier on the basis of cost and supply factors.

On the issue of conservation, neither company had a serious policy to regulate the use of wood, but rather responded to government directives. In the case of ATP, because production has virtually ceased, one could say wood is being preserved. But surely that is not the type of conservation in view. MTC is using more and more secondary species, but this is not attributable to nationalization per se. The company must do so as its limited timber concessions are increasingly depleted of prime timber.

The other side of conservation which may be more important in terms of the future, is reforestation. Reforestation not only replaces the natural timber extracted from the forest, but replaces it with predetermined, commercially valuable species in high densities. The companies, however, do not undertake any reforestation, which is the responsibility of the government. In Ghana, the companies pay a fee to the government for each log extracted to pay for reforestation by the Forestry Department. During the period of study (1972-83), however, although companies paid the fees, no reforestation was done.

Conclusion

Nationalization did result in the government attaining control of ATP and MTC. However, national control of the industry has not resulted in expansion of overall employment in the companies. While

MTC was able to expand its level of employment marginally after nationalization, ATP has had to cut back drastically, with the remaining workers hanging on because they have a faint hope that the situation may improve enough for them to collect their retiring benefits which cannot be paid now. With regard to high-level positions within the firms, ATP lost all of its UAC-related employees and most of the Ghanaian high-level personnel. In the case of MTC, nationalization has not resulted in the departure of all expatriates, even though their number has been halved. Neither has nationalization affected import dependence or conservation of resources, other than the fact that ATP's concessions remain largely unexploited due to the limited capacity of the company. Instead, the social services, hitherto provided by ATP, are in jeopardy. It seems that, in a situation where the state is not in a position to subsidize the operations of a nationalized industry, the gains of nationalization, whether economic or social, depend on the ability to sustain viable, technically efficient operations within the firm. Technological capacity building is therefore a crucial determinant of the success of nationalization.

The performance of the timber industry depends on certain exogenous as well as internal factors. There is no doubt that firms operating in Ghana, especially since 1975, have been constrained by the generally disappointing performance of the economy. In particular, artificially low domestic prices, overvalued currency, shortage of foreign exchange, poor state of economic infrastructure, and shortage of trained personnel in the face of mass emigration of skilled manpower affected economic activities. Until October 1983, the government's attempts to contain the situation took the form of more and more administrative intervention in the running of the economy. It is within the context of these exogenous factors that the relative performance of ATP and MTC has to be examined.

Performance of the Ghanaian Economy

The Ghanaian economy experienced rapid growth after political independence in 1957. There was great optimism as the gross domestic product (GDP) registered an average real annual growth of about 8% with corresponding growth in per capita income. The GDP per capita at 1970 prices was GHC 263 in 1962, more than twice the national average for sub-Saharan African countries and three times that of India at that time (Huq 1984).

The economy began to slow down in the 1960s with GDP growth rate falling to a 2.8% annual average. But that was sufficient to register marginal improvements in standard of living as population rose at an annual rate of 2.4% (Huq 1984). The declining trend continued in the 1970s with most years registering negative growth rates.

The year 1975 seems to have been a major turning point in the performance of the economy of Ghana with most of the gains of the previous two decades having withered away. Per capita income declined at an alarming rate of 4.23% per annum between 1975 and 1981. Huq (1984: 2) noted that "the average Ghanaian in 1976 was worse off than he was in 1956. At 1970 prices, GDP per capita in 1980 was [GHC] 201 and the corresponding figure in 1956 was [GHC] 226." The declining trend continued in 1982 and 1983.

The evidence of economic deterioration goes beyond the decline in incomes. Inflation averaged about 50% per annum between 1975 and 1982 (Table 9). There has not been a single year without a substantial budgetary deficit since 1970. Exports, imports, and domestic capital formation have all rapidly declined as seen in Table 21.

Table 21. Some indicators of the performance of the Ghanaian economy, 1971-81.

Indicator	1971	1974	1977	1980	1981
Gross domestic product (GDP)					
In 1970 prices (million GHC)	2377	2572	2215	2326	2261
Index (1970 = 100)	105.22	113.84	98.83	102.99	100.09
Per capita GDP (1970 prices)	271	272	218	212	201
Per capita index (1970 = 100)	102.65	103.03	82.58	80.30	76.14
Exports as % of GDP (current prices)	17.73	20.52	10.48	8.59	3.08
Imports as % of GDP (current prices)	21.44	22.77	11.55	9.36	4.07
Domestic capital formation as % of GDP (current prices)	14.13	13.04	10.91	5.39	3.48
Wholesale price index (1977 = 100)	18.5	35.3	100.0	349.5	523.7
Budget deficit (million GHC)		41.1	-1478.5	-4440.2	-5162.0

With the exception of 1981, the budget deficits pertain to 1970/71, 1973/74, 1976/77, and 1979/80.

Sources: Huq (1984), Ghana, Central Bureau of Statistics (1981, 1983).

The author is in full agreement with Huq (1984) that the real causes of the sharp decline in the economy must be found outside traditional scapegoat explanations, such as lack of natural resources, inadequate infrastructure, and deteriorating terms of trade. Ghana is relatively well endowed with cocoa (until recently the world's leading producer), gold, diamonds, manganese, bauxite, and arable land (more than three quarters of the total area of 238,538 km^2). The world's largest man-made lake (Volta Lake), created as part of a 768-MW hydro scheme, to date has met the immediate power needs of the economy.

The physical infrastructure, particularly roads and railways, has worsened considerably. No new railway lines have been constructed since independence. Maintenance has been so poor that services are reduced and derailments have become frequent. The condition of the infrastructure is itself the result of crises in fiscal policy. Although the economic infrastructure of the country has deteriorated considerably, with good rainfall in 1984, the system is supporting a level of economic activity comparable to that recorded in the early 1970s.

Neither can the vicious-circle theory, with its assumption of poverty causing population pressure and low incomes leading to low savings and investments and lower incomes, be of much relevance to the Ghanaian experience. The economy registered a savings and investment ratio of about 20% of GDP around 1960 (Killick 1978: 67). Population density was estimated at 52 per km^2 in 1984, with growth in population less than 2.4% per annum which, while high by advanced countries' standards, was below the average for developing countries and could hardly be a major constraint.

Lack of foreign exchange no doubt constrained the performance of industries because vital inputs could not be imported, leading to manufacturing capacity utilization of less than 15% in 1983. Killick (1978: 107-110) has demonstrated that only a limited amount of the fall in export earnings could be explained by deteriorating terms of trade. The major factor has been declining export volume. For example, cocoa exports which reached 450,000 in the early 1960s declined systematically to about 150,000 t in 1983, mainly as a result of government controlled price disincentive.

It is the view of the author that Ghana's economic decline is the result of economic policies pursued by successive governments. In particular, the policies of rigid and inefficient price controls and maintenance of overvalued currencies and of an inefficient and large public sector have depressed economic activities. This view was shared by the Council of State, an advisory body to the President set up under the third republican constitution of Ghana.

> Underlying all the economic problems of Ghana are two fundamental factors viz: (a) the attitude and policies of the successive governments of Ghana which not merely maintained an overgrown, inefficient and undisciplined public sector, but also constrained the development of an effective private sector; and (b) a faulty price-incentive system which does not reward productive activities commensurately. (Ghana, Council of State 1981: 3)

The above becomes clearer when one examines official and black market prices. For most of the period since 1975, official prices for manufactured products have averaged less than half the black market rates. A survey of the prices of products, such as rice, sugar, and palm oil, in 1982 by the author indicated that official prices were below 30% of the black market prices. Unfortunately, the enforcement of price controls was more effective at the ex-factory level than at the retail level. Although such interference depressed production, middlemen and traders reaped windfall gains.

Exports were also discouraged by an overvalued currency. The extent of overvaluation of the cedi may be judged from Table 22 which presents official and unofficial (black market) rates in Ghana for selected years.

The maintenance of an overvalued exchange rate and price controls had serious consequences for the economy and government revenues. Over 60% of government revenues comes from import duties, excise duties, and company taxes. All these are depressed by an overvalued exchange rate and lower producer prices because taxable values become smaller. Second, the price controls, and especially low cocoa prices, adversely affected production and productivity. Official exports suffered the severest blow as smuggling increased. A thriving underground economy behind a facet of regulations, prohibitions, and bureaucratic corruption affects equity and efficiency (Tanzi 1983), and the underground economy pays no taxes. Faced with economic stagnation and even retrogression, developing countries tend

Table 22. Indicators of currency overvaluation in Ghana.

	Number of cedis (GHC) per		
	Pound sterling	U.S. dollar	1000 CFA francs
Official rate, 1975-October 1983	5.6	2.75	10.15
Black market rates			
January 1978	16	10	36
October 1981 (estimated)	75-85	40-45	120-140
September 1983 (estimated)	180	140	250

Source: Ghana, Council of State (1981: 18).

Note: The September 1983 estimate is by the author. The currency was officially devalued in October 1983.

to look for real or imaginary scapegoats. In most cases, direct foreign investment has been one of the victims, with nationalization being used as the policy instrument.

Evidence adduced from surveys of companies by Ghana Investments Centre, the country's investment promotion agency, provides a unanimous conclusion that industries operating in Ghana were severely constrained by the overall performance of the economy. The problems that faced industrial firms and are evident from the above brief outline of the performance of the economy include

- artificially low prices of manufactured goods for the local market;
- overvalued currency, which penalized exporters;
- lack of foreign exchange to import essential inputs such as spare parts and raw materials (aggravated by the high import content of the industrialization program of the 1960s);
- poor state of economic infrastructure, particularly road systems and port facilities;
- lack of technically competent manpower, largely as a result of mass emigration in the face of economic hardships.

The impact of each of the above constraints varies from sector to sector and from firm to firm. The extent to which the performance of the nationalized industries could be attributed to these is examined in the following sections.

Domestic Price Controls

The Government of Ghana through its Prices and Incomes Board has, in the past, controlled prices of manufactured goods in Ghana. Producers submit details of their cost structure and, on approval, they are allowed a profit of less than 25%. Delays in granting approval and inadequate profit margins in the face of double- and even triple-digit inflation rates have been major disincentives to manufacturers. Many private producers are able to bypass this constraint by selling on the black market while the state-owned enterprises cannot officially do this.

It is this price control mechanism that partly accounts for inadequate revenue collection by governments of developing countries, because the taxable base is thereby artifically reduced. However, most consumers end up paying prices determined by market forces of supply and demand with only a few government agencies and individuals buying goods at the controlled prices. The resulting black market yields huge profits to intermediaries who are able to purchase goods at the controlled prices and resell them on the black market.

Our investigation revealed that price controls have not been a significant hinderance to the timber industry. The enforcement of price controls has been largely a policy to restrain prices of "politically sensitive" consumer goods such as bread, milk, sugar, and cloth. Even though an attempt was made, around 1979, to fix prices of timber products, the idea was not pursued because of multiplicity of species, grades, and quality. None of the timber firms visited gave domestic price control as a constraint on their activities.

On the contrary, local inflationary prices resulted in the diversion of products from exports to the internal market. This is clear from the sales trend of both ATP and MTC (Tables 11-15).

Overvaluation of the Cedi

It was the inadequacy of returns on exports that became a major constraint on the industry. Between 1975 and 1983, the official exchange rate was a fraction of what prevailed in the black market (Table 22). Although very limited empirical study has been done on the real level of overvaluation of the Ghanaian currency, attempts to devalue the cedi to reflect its real value since October 1983 have clearly shown the extent to which the cedi was overvalued.

The impact of this on the timber industry was catastrophic. It contributed to ATP dropping out of the export market and, in the case of MTC, exports fell from over 75% of total sales in 1980 to about 30% in 1982. The switch to the domestic market was necessary to maintain profitability. ATP, however, could still not sustain profitable operation because of the drastic decline in actual output.

An attempt by the government to ease the impact of overvaluation of the cedi resulted in the introduction of an export bonus of 20% payable in local currency. But that was still inadequate to compensate exporters. The bonus, which should have been maintained (because the cedi is still overvalued), has been withdrawn since the massive devaluation of the cedi in 1983.

Exporting part of a timber company's produce from Ghana has other implications which may be used to judge the capability of general management of the company. Local sales may generate an adequate amount of cedis but the companies need foreign exchange to bring in inputs to sustain their operations.

Availability of Foreign Exchange

There are different but related sources of foreign exchange for timber companies to service their operations in Ghana. The first has to do with a 20% allowable retention of export earnings in foreign exchange. A company, therefore, has to export part of its produce to enjoy this source.

The second is through annual allocation of foreign exchange to the industry from the country's foreign exchange earnings either through the Ghana Timber Marketing Board or the Ministry of Lands and Natural Resources. Like other economic decisions in some developing countries, the yardstick for allocating foreign exchange is shrouded in uncertainty. However, the size of operation and its perceived needs are factors that are considered. In particular, the export performance (foreign exchange earning capacity) of the company is quite important. Tables 23 and 24 clearly indicate that a correlation exists between foreign exchange earned by a company and the amount of import licence granted and, eventually, the amount of hard currency granted (letters of credit established columns).

The third source of hard currency open to the companies is international aid - both bilateral and through multilateral agencies such as the World Bank. Once again, the government has tended to allocate these loans to specific firms in the industry according to their export performance and, hence, their ability to repay the loans. Upon government approval, the companies may also arrange for private overseas loans. The veneer plant at MTC was acquired on such terms.

The foregoing phenomena have worked in favour of MTC which has been able to maintain a viable export operation, unlike ATP. As such, not only is the company receiving relatively greater import licence allocations and portions of official aid, but also, at present, the

Table 23. Foreign exchange earned and granted to ATP, 1972-81.

Year	Foreign exchange earned (GHC)	Import licence allocations (GHC)		Letters of credit established (GHC)	Credit established as % of allocation
		Applied for	Granted		
1972	NA[a]	1224922	1224922	1196153	97.9
1973	7722746	949403	949403	785075	82.7
1974	7172177	2163000	2163000	1455855	67.3
1975	6046811	1200000	1197620	1103273	91.9
1976	5288654	6064239	3898000	3863022	63.7
1977	351578	2697000	2697000	1023729	38.0
1978	6017065	15730448	2023271	0	0
1979	4461834	NA	2500000	NA	NA
1980	994326	NA	1257720	NA	NA
1981	2615	NA	NA	NA	NA

[a] NA, not available.

Source: ATP, unpublished records.

Table 24. Foreign exchange earned and granted to MTC, 1972-78.

Year	Foreign exchange earned (GHC)	Import licence allocations (GHC)		Letters of credit established (GHC)	Credit established as % of allocation
		Applied for	Granted		
1972	5683	749696	420000	270000	36.0
1973	7835843	865850	613850	597535	69.0
1974	5831845	750000	750000	750000	100.0
1975	10612194	800000	800000	711414	88.9
1976	14690738	3213500	3210000	2691203	83.7
1977	15268180	3236000	3236000	3230627	99.8
1978	27921491	3040000	1900000	792862	26.1

Source: TIHOC (1981).

company is enjoying the services of three World Bank experts. This by no means indicates that MTC is getting adequate foreign exchange to meet its needs. Rather, it explains the relative position of the company vis-à-vis ATP.

The overall impact of lack of foreign exchange on the companies will be discussed in the context of technological capacity at the firm level, where the issue manifests itself in inadequate machinery and equipment, tools, and other inputs for maintenance. Here, the main concern is to establish the point that lack of foreign exchange has constrained the operations of the industry. The magnitude of the constraint has depended on the export capacity of the respective companies. The ability to export is a major technological capacity indicator.

State of Economic Infrastructure

Timber and timber products are bulky items with transportation and labour constituting two major cost components. The successful operation of the industry, therefore, depends on the state of the company's transportation equipment (trucks, tractors, caterpillars, etc.), the condition of the road and rail networks, and shipping facilities in the case of exports. The first condition is an internal factor and will be taken up later.

The poor state of the road and railways in the country has adversely affected the performance of firms within the industry since nationalization. ATP is situated about 74 km from the nearest railhead. The road linking the Samreboi factory site and Prestea, the railhead, is in a bad state and was impassible to light vehicles during our last visit in January 1985. An alternative route a few kilometres longer is, however, motorable.

The 74-km road is privately owned by the company. Its state of repair largely depends on the performance of the company, especially its road building equipment. The rest of the route to the port city of Takoradi, about 135 km, is relatively better.

MTC, on the other hand, is 150 km from Kumasi, the closest railhead. This road is a public one, but, the condition of over 60% of it is so bad due to lack of government maintenance that it has become the private responsibility of the company to keep it motorable. Kumasi is about 320 km from the port of Takoradi; a good part of the two roads linking them is in very bad condition.

Maintenance of roads increases the operating costs but as long as the companies have adequate equipment they are able to keep them in relatively good condition. It is of importance to note that MTC, being farther away from the port, has greater transportation problems.

The rail system has been another serious constraint on the companies' performance. Frequent derailments, irregular schedules, and inadequate carriage facilities combine to retard the rate of delivery of timber products to the port.

Of late, the companies have encountered another major bottleneck. The Takoradi harbour, which is used for exporting timber, is old and many of its facilities are in an appalling state. The whole harbour is being threatened by silt and is in dire need of dredging. By the end of 1984, there were few on-land cranes in good working condition to load timber products. Ships have to use their own cranes, but only a few have cranes strong enough to lift the heavy loads.

The economic decline in Ghana has reduced national imports more than 50% during the last decade. As a result, fewer ships are calling at Ghanaian ports and the companies are finding it difficult to meet export schedules with products piling up at the harbour.

MTC and ATP have responded differently to these constraints as the evaluation of their performance indicates. It is the view of the author that the differences in their response can be explained by the technological capacities existing at the two firms.

Trained Personnel

One of the consequences of the economic decline of Ghana has been the mass emigration of Ghanaians into other countries, notably Nigeria. In 1983, as many as one million Ghanaians (out of a population of 12.24 million) who had illegally gone to Nigeria were forcibly returned home. Although the majority of the emigrants were unskilled, a good proportion of trained Ghanaians have left for greener pastures abroad. Unofficial estimates indicate that at least 50% of medical doctors and a third of qualified engineers, quantity surveyors, and accountants have left Ghana since 1979. The teaching profession was one of the most severely hit areas because demand for teachers in neighbouring countries was high. Another category of personnel who were readily attracted to neighbouring countries was technicians and artisans.

ATP and MTC have the disadvantage of being less than 40 and 70 km, respectively, from Côte d'Ivoire where the economy has been performing better with a convertible currency. Some of those who don't want to migrate take to the lucrative business of smuggling. Both companies, it was noted in chapter 7, lost skilled personnel in the professional managerial and technical categories. Once again, ATP suffered more because postnationalization conditions were worse, with salaries sometimes in arrears up to 6 months.

The most critical personnel in the companies are engineers and those in top management positions, including expatriates. The employment statistics (Tables 19 and 20) reveal that ATP lost all its expatriate technical personnel and a large number of its Ghanaian skilled personnel. The situation was better at MTC where expatriate personnel could be retained and only a few top-level Ghanaian personnel have resigned since nationalization. The manpower situation in the companies largely accounts for their respective performances.

Bureaucratic Interventions

Two kinds of bureaucratic constraints will be discussed: the interference of the state as a shareholder, and normal official regulations affecting all industries in the sector. The government as the sole owner appoints the Board of Directors of the companies as well as the managing directors. The major problem at the directorate level came after the 1981 revolution when regular boards of directors were replaced by committees made up of senior management, trade union, and Workers' Defence Committee (political organ of the government in work places) representatives. This was not successfully implemented in most private organizations, but state-owned companies have suffered serious setbacks in industrial relations since.

MTC management appointments have generally not suffered from political interference. This is partly due to the fact that the company has a good crop of technical men, both locals and expatriates, who remained after nationalization. On the other hand, a vacuum was created at the top in ATP with the departure of UAC-linked expatriates and Ghanaian staff. As a result, a condition was created whereby politicians have had to fill many positions. The company has suffered from rapid turnover of senior staff including managing directors (MDs), with the longest serving MD or chief executive being the present one who was in his third year in 1985. But already the workers, with the support of some government functionaries, were insisting on his removal during the period of this study.

One complaint that was repeated several times by the companies pertains to Ghana Timber Marketing Board (GTMB) regulations and government charges on the industry. Export contracts have to be approved by GTMB and this sometimes causes delay. Companies must also seek approval to use their 20% retention; this requires receipt of pro-forma invoices from overseas and further delays in the issue of import licences. It must be pointed out that these problems are not peculiar to the timber industry.

A total of 13% of export proceeds from the timber industry is paid to various government agencies. A 6% export levy is payable to the Customs and Excise Department 4 days after issue of a bill of lading. Getting the department's inspectors to the factories to authorize packaging for shipment is another problem. GTMB levies 3% of contract prices in local currency plus a further 2% payable in foreign currency for its services. The Bank of Ghana charges 2% of proceeds for negotiating documents. In addition, MTC pays overseas agents a commission of 4%. All of these adversely affect financial performance.

Part III

Technological Capacity

In chapter 8 the performance of African Timber and Plywood Limited (ATP) and Mim Timber Company (MTC) was reviewed in the context of exogenous factors, but the relative performance of the companies can hardly be explained in terms of external factors only. External factors operate through their impact on the various capacities within the companies. This makes an evaluation of technological capacity in nationalized firms a crucial determinant of performance. This chapter examines the state of technological capacity in the companies; the following chapters seek to explain the phenomenon in terms of technological capacity building effort before nationalization, the impact of nationalization, and efforts to develop indigenous capacities since state takeover. The somewhat artificial classification of these interrelated issues is to aid analysis. There is no doubt, for example, that inherited technological capacity influences postnationalization capacity building.

Although technical capabilities of employees of a company may be the most important element in technological capacity in the firm, the institutional framework within which the skills are deployed and material resources in terms of plant, equipment, and other inputs available to the staff will also be considered. The tendency to be overcritical of personnel who may be trying to make the best of a bad situation will thus be avoided.

Elements of Technological Capacity in the Timber Firms

In chapter 2 technological capacity was defined as the sum of people with the requisite skills, the stock of technical knowledge for them to draw upon, the tools and instruments to work with, and the necessary institutional framework for realizing company or national objectives. In this chapter, this concept is applied to the timber companies. Sawmilling, veneer production, and plywood making can be described as mature processes in the sense that the technology is widely known and, therefore, we shall not dwell on questions pertaining to the stock of technical knowledge available for employees to draw upon. That would depend more on the ability of the senior personnel and their knowledge of the industry. That leaves three major considerations: the institutional framework; tools and instruments, which in the case of timber companies consist of factory facilities, road building equipment, and plant and equipment for log extraction and transportation of logs and products; and the quality of employees, in terms of formal training and, even more important, experience.

Following Farrell (1979) our starting point was an identification of critical functions and corresponding skills in the industry.

The organizational charts of the companies, which have not changed since nationalization, were obtained. These were compared with that of African Timber and Plywood (Nigeria) Limited (ATPN), which was used as a model company in view of both the similarity of its organization and operations to ATP Ghana, and the fact that, at least until 1983, ATPN was not operating under the external constraints that prevailed in Ghana.

There was marked similarity between the organizational structure of ATP and MTC, but examination of the marketing departments revealed a difference in their relative status in the two companies as well as the quality of employees (see second part of this chapter). Thus extensive interviews with senior personnel of ATP, MTC, and ATPN had to be undertaken by the research team. All senior personnel in the three companies were specifically interviewed to identify their training and experience and, in the cases of the Ghanaian companies, those of their predecessors. The administration departments of the two companies under study supplied detailed information on personnel before and after nationalization in terms of their nationality, training, and experience. Inventories of machinery and equipment were also taken and compared. Helpful discussions were held at UAC's timber division headquarters, in London, with people who had been involved in setting up ATP. Finally, other companies involved in the marketing of tropical hardwoods (including Ghana's timber products) in Britain were consulted. This was quite important because, for example, it became obvious from speaking with wholesalers that those who bought Ghana's timber products put a premium on both the cut (finish) and the reliability of delivery schedules to such an extent that they were sometimes willing to pay up to 50% premium on the products of MTC for meeting these two requirements. Although detailed information could not be provided, this no doubt contributed to the success of MTC.

Institutional Framework

It was interesting to note that in both firms there has not been any major change in the organizational structure since nationalization. Even though few differences could be detected from the charts themselves, MTC and ATP represent two extremes of organizational structure. MTC, it will be recalled, was owned by a resident expatriate. As such, the company operated as a full entity from Ghana. All departments necessary for efficient operations were established within the company - administration, production, finance, engineering, marketing, and forest operation departments. For selling its exports, the company pays overseas agents a fee which currently stands at 4% of the sale price. To facilitate efficient operations, the company has offices at Accra to deal with government bureaucracy, at Takoradi to oversee shipping and Ghana Timber Marketing Board matters, and at Kumasi where products from the factory are sent for distribution.

With the major shareholder resident on the company's premises before nationalization, planning, reporting, and good industrial relations had been established. This was reflected in the ability of the company to provide almost all the information used in this study within 2 days, during a visit by the research team (ATP took several months to assemble the same amount of data). To do this, MTC had to engage all the necessary administrative, production, financial, engineering, and marketing personnel including auxiliaries such as legal personnel. In short, MTC had, and still has, a functional organizational setup to discharge its business as a going timber concern.

As noted earlier, ATP was only a production centre for UAC's International Timber Division. Planning, marketing, and financial administration were undertaken from London or as part of UAC (Ghana) Limited, a conglomerate of 17 companies. Even for vital services, such as production and engineering, UAC had no need to keep a full complement of personnel at the factory. Troubleshooting teams could be sent in at any time to provide support services. In other words, ATP, despite its scale of operation, remained a half-factory, even though on the surface it had all the vital departments.

From the foregoing we conclude that ATP, as a subsidiary of a TNC, did not have the functional institutional framework necessary to operate as an independent entity. Steps had to be taken by the state on nationalization to remedy institutional deficiencies. The maintenance of such a framework after nationalization would affect firm-level operations. MTC's relative success can be explained partly in terms of its organizational setup. It is therefore important to assess the type of skills needed for the performance of specific activities within the firms and the extent to which these were met before and after nationalization.

Critical Functions and Core Skills

Notwithstanding the danger of oversimplification, our starting point should be a theoretical assessment of critical high-level personnel needed at the factories to manage affairs adequately. In most companies there are some activities that are necessary for the ultimate successful operation of the firm, but are not peculiar to the industry. Examples are general cleanliness, security, and even such specialized functions as legal services. The provision of utilities and public relations also fall into this category. To assess the technological capability of a firm, the functions and technologies involved in the operations must be disaggregated to identify the critical and firm-specific skills and the core technology needed for success.

Applying the method outlined earlier in this chapter, we came up with the following functional classification of jobs in a timber concern operating on the scale of ATP and MTC and have organized it around what prevails at ATP. The actual grouping may vary from firm to firm, but it was quite clear from an examination of the industry that the specified functions and skills have to be provided in one form or another. A drawback in skill assessment is that the industry frequently uses people with two or three decades of experience, but limited formal qualifications. In the engineering sections, for example, middle-level technicians (e.g., holders of British City and Guilds qualifications), with 10 years' experience can be classified as engineers. We have adopted such a pragamatic view in assessing the quality of personnel in the firms. The results of our exercise are presented in Table 25.

The analysis shows that at least 12 engineers are needed for full operations at ATP and MTC. In practice, about eight engineers can run the factory provided skilled technicians are available. These should include a minimum of two plant (mechanical) engineers, one

Table 25. Functional classification of critical manpower needs in large-scale timber operations with particular reference to ATP and MTC

Functional area	Assessment of critical personnel and skills needed
General administration:	
Chief Executive functions: generally overseeing all aspects of firm's operation.	Managing director (MD) with diploma or graduate-level basic scientific training in fields such as engineering, economics, and production management, preferably with about 10 years' experience in managing a modern timber complex.
Economics and planning: specification of products' quality, production levels, production schedule, etc.	This function comes directly under the MD. At least two graduate-level personnel with training in economics or related fields such as operational research and accounting with experience of not less than 3 years. People from other disciplines, especially engineers with industry-specific experience, are equally good.
Finance and Accounting: to oversee financial and costing operations of the firm.	At least two qualified accountants, ideally a financial accountant and a cost accountant.
Wood Extraction: forest management, identification, rotation, and selection of trees, wood extraction, and storage, etc.	This requires a team of forestry personnel headed by a diplomate or graduate forester and including a forester with wide experience in managing tropical hardwoods and a wood technologist responsible for overseeing storage of timber and fungi and pest control. Experience counts here as much as any formal education and personnel with wide experience but limited education have proved satisfactory. Another group of skills critical to wood extraction pertains to road construction (civil engineering) and maintenance of earth-moving and logging equipment, such as caterpillars and haulage transportation. The critical manpower needs for these are discussed under engineering.
Production: overseeing production operations in the various mills.	A diplomate in engineering, wood technology, or industrial management would be ideal, but experience is

continued

Table 25. Continued.

Functional area	Assessment of critical personnel and skills needed
	more essential than formal qualification. Each mill requires one production manager.
Engineering: preventative maintenance, repairs, installation of new equipment, etc.	Someone has said that sawmilling is an engineering activity. Besides the capability of the general management staff, the strength of the engineering departments is the most important determinant of the success of the operations. In fact, out of the engineering personnel critical production personnel are usually developed. The operations of ATP and MTC require plant, mechanical, electrical, transport, and civil engineering services. The following skill requirements are organized around the divisions of the engineering department of ATP which generally fit MTC. An engineer could be a City and Guilds Final Certificate holder with a minimum of 5 years' experience, or a graduate engineer with not less than 2 years' relevant experience. The types of engineers required are listed below with indication of their responsibilities.
Chief engineer	To supervise activities of all engineering departments, with background in either mechanical or electrical engineering, but with a wide range of experience in overseeing a modern plant. Will normally work in one of the specific engineering departments in addition to supervisory duties.
Mills engineers	A team of technicians, but with two plant or mechanical engineers and one electrical engineer, with background in production engineering, to be responsible for the maintenance of mill plants and equipment. Ideally each mill should have a plant engineer, with one electrical engineer servicing them all.

continued

Table 25. Continued.

Functional area	Assessment of critical personnel and skills needed
Central workshop	At least one mechanical engineer who will also be responsible for training. Must have a wide range of engineering experience.
Transport engineers	The scale of operations of ATP and MTC requires at least three plant or mechanical engineers with one or two experienced in maintaining caterpillars and heavy machinery, and another for light vehicles. In addition, they must be supported by one planning engineer who oversees major overhauls.
Civil works engineer	To be responsible for construction of roads and buildings.
Power station engineer	To be responsible for maintaining the powerhouse at ATP based on steam turbines. An engineer with expertise in steam boiler systems is ideal.
Marketing: responsible for local and overseas sales and customer servicing.	Because the local market is not selective or particular, the critical skill needed is selling overseas. Backed by the accounting division, the marketing division will require several people with background in economics or international marketing, who are familiar with the international wood market in particular. Relating to an agent on the main markets will be an advantage.

electrical engineer, two transport engineers (one for heavy-duty and the other for light vehicles), a civil engineer, powerstation engineer, and one workshop or training engineer in addition to the chief engineer.

The above table also shows that at least 20 high-level personnel are needed for the efficient operation of ATP and MTC. It may seem naive to suggest that a company, that at one time had a total work force of over 2500, requires only about 20 critical personnel to ensure efficient operation; 20 may even be an overestimate because each of them will be responsible for the selection and training of a team of technicians.

The strategic role of two categories of personnel - engineers and economics or financial experts - was surprising. From the point of view of building industrial technological capability, this may imply reappraisal of high-level education in developing countries. The only timber industry-specific experts are the foresters and wood technologists.

At this juncture, it is pertinent to refer to ATPN. As at October 1983, the company was operating with 10 expatriates: a general manager, a specialist marketing officer, and eight engineers. There was an approximately equal number of Nigerians of the same calibre.

Capabilities at ATP

An analysis of the top critical employees of ATP as at August 1983 reveals that, in terms of people with graduate-level foundational education in economics, finance, and management, only the managing director (with Master's degree in Business Administration) and the chief accountant (with BSc in Accountancy) were graduates. The situation at the engineering departments was rather disappointing with virtually no graduate or chartered engineers. There were, however, eight people with final City and Guilds qualification, three of whom could be classified as graduate equivalents. There was also one wood technologist with a Master's degree. The accountant has since resigned. In other words, from our assessment of the 20 high-level personnel needed to run the establishment efficiently, even if all the City and Guilds certificate holders are included, ATP was operating with less than 11 such personnel. The analysis has excluded auxiliaries like medical services.

The critical manpower position at ATP becomes more evident when the situation in 1983 is compared with that of 1976 before nationalization (Table 26). It is clear that UAC had many City and Guilds certificate holders with many years of industrial experience rather than engineers. This is confirmed by a similar situation at ATPN.

There has been a general downgrading of personnel in terms of foundational training after nationalization with factory-trained artisans occupying engineering positions. In Table 26, middle school leaving certificate, which in Ghana is a basic 10-year primary or elementary school certificate, appears as the predominant foundational training for most of the staff in charge of strategic functions in the firm.

How have the basic training weaknesses described above revealed themselves in the actual performance of the company? Overall performance was discussed in part II. What is undertaken here is specific functional activities which together produced the overall results. With respect to ATP, we shall consider these under general administration, finance, production, marketing and purchasing, forest operations, and engineering. Engineering is treated last because capabilities here need a more thorough discussion. Next to overall management, engineering constitutes the most critical functional category in the enterprise.

General Administration

These vital management functions - planning, setting objectives, monitoring, etc. - are very weak at ATP due to the fact that the man-

Table 26. Comparison of personnel in selected positions at ATP, before and after nationalization.

Position	Prenationalization (1975)			Postnationalization (1984)		
	Basic qualification[a]	Years of experience	Nationality	Basic qualification[a]	Years of experience	Nationality
Managing director	Chartered engineer (BSc)	10	British	BSc (admin.) MBA	2	Ghanaian
Chief accountant/ financial accountant	ACA part 1, BSc accounting	28	Ghanaian	BSc (accounting)	3	Ghanaian
Chief engineer (engineering coordinator)	City and Guilds	3	British	City and Guilds	18	Ghanaian
Mechanical engineer	O level	-	British	Vacant	-	-
Electrical engineer	City and Guilds	11	British	MSLC	30	Ghanaian
Powerhouse Superintendent	City and Guilds	4	British	City and Guilds	7	Ghanaian
Transport engineer	City and Guilds	5	British	City and Guilds	5	Ghanaian
Forest operations manager	City and Guilds	7	Ghanaian	Vacant	-	-

continued

Table 26. Continued.

Position	Prenationalization (1975)			Postnationalization (1984)		
	Basic qualification[a]	Years of experience	Nationality	Basic qualification[a]	Years of experience	Nationality
Light vehicles	City and Guilds	7	Ghanaian	MSLC	27	Ghanaian
Production coordinator	HNC (mechanical engineering)	12	British	Teacher's certificate (about O level)	11	Ghanaian
Plymill manager	City and Guilds	6	British	MSLC	17	Ghanaian
Plymill production manager	O level	17	Ghanaian	MSLC	23	Ghanaian
Sawmill manager	City and Guilds	7	British	MSc (Wood Tech.)	5	Ghanaian
Sawmill superintendent	City and Guilds	24	British	MSLC	29	Ghanaian
Sawmill yard superintendent	City and Guilds	24	British	MSLC	29	Ghanaian
Senior manager of forest operations	A level	16	Ghanaian	MSLC	27	Ghanaian
Supplies department/ supplies manager	City and Guilds	8	British	MSLC	20	Ghanaian

continued

Table 26. Continued.

Position	Prenationalization (1975)			Postnationalization (1984)		
	Basic qualification[a]	Years of experience	Nationality	Basic qualification[a]	Years of experience	Nationality
Forest manager	Forest School Certificate	13	Ghanaian	MSLC	30	Ghanaian
Powerhouse superintendent charge manager	Chartered Engineer	11	Ghanaian	City and Guilds	5	Ghanaian

[a] BSc, Bachelor of Science; MBA, Master of Business Administration; ACA, Accredited Chartered Accountant; City and Guilds, standard British technician's qualification below university degree; MSLC, middle school leaving certificate; O and A levels, ordinary and advanced secondary-school graduation certificates (analogous to junior and senior matriculation in the North American system); HNC, Higher National Certificate, a polytechnic engineering qualification in U.K.

aging director does not have trained economists and accountants with the requisite experience in industrial organization at middle and senior management levels. The hand-to-mouth way in which operations are being undertaken means no long-term plans are made or, more accurately, can be made. This situation has been worsened by the cumulative debt of GHC 128 million as at the end of 1984. The company, therefore, cannot raise even normal commercial credit with which to operate.

Finance

The company could operate with one middle-level accountant during the UAC days because all major financial recording and analysis was undertaken by UAC International. A factory of ATP's size requires at least two qualified accountants with a supporting staff of about five experienced bookkeepers and accounting personnel. This section is, therefore, not adequately staffed. The only graduate in the department has resigned. The lack of capability is reflected in poor financial record keeping and minimal cost analysis. Even production capacity figures for the various mills are hard to acquire.

Production

The company has no conventional staff of production-manager calibre at any of its four mills; the production coordinator resigned in 1984. The timber industry is known for its use of people with basic elementary education and decades of experience in managing production lines. This is due to the routine nature of many of the activities and is possible in a functional organization with high-level manpower in other departments offering much needed complementary services. This is not the case at ATP. The situation at ATP has been aggravated by the high rate of resignation of experienced factory hands. All the mills are being manned by people who can rightly be called operatives.

Marketing and Purchasing

Local sales, once the company is able to produce at an acceptable capacity, are no problem; customers will call at the company's door. The real test of capabilities in this area is overseas marketing. Before nationalization, Ghanaians were not involved in overseas marketing or purchase of inputs from abroad. Today the company has no marketing expert or functional marketing department.

Forest Operations

It is the view of the author that even though the company does not have personnel in this area with the requisite foundation training in forestry and wood technology, the senior staff in this division have acquired sufficient experience to meet the short-term needs of the company. If not for the engineering and supplies constraints, their performance would have been average. In the medium term, the department will need to be strengthened.

Engineering Departments

None of the engineering departments undertakes preventive maintenance. They respond to breakdowns only. This is partly because of the absence of spare parts which means some equipment has to be left to wear out completely. The other reason is that, in most departments, the level of capability of the staff is such that they cannot institute or monitor such a system.

Repairs have also been constrained by lack of basic inputs such as copper wires for rewinding motors, steel for fabricating parts, and sometimes even lubricants. In fact, on one of our visits, only two of five caterpillars were working due to lack of engine oil. This makes it quite difficult to assess the performance of the engineering staff. It is clear that technological capabilities in the engineering departments are woefully inadequate, but it is not possible to judge to what degree machine breakdowns and engineering problems can be attributed to the quality of staff.

One thing was quite clear, however. Within the constraints under which they operate, the engineering staff have been able to undertake numerous innovations to keep the factory running. At least 40% of all spare parts (formerly imported) are now fabricated at the company's workshops. Hog knives, discarded by UAC, have been re-sharpened and adjusted to last up to 50% longer.

The innovations are so numerous that only selected examples can be given here. The most common was modifying machines to take different sizes of belts. Others involve more complex engineering capabilities like making bearings out of bronze (friction material not suitable for bearings) and thin-lining them with steel. The resulting bearing requires regular lubrication but works all the same. By the end of August 1983, almost all machine parts from gears to shafts were being made at the workshop. Cannibalizing one machine to keep others going is a common practice. Several machines have been modified to the extent that even when new parts are available, they cannot be fitted. The assessment of the company by a team of UAC experts in 1981 confirmed that the engineering departments, given the resource constraints and the level of foundational training they possess, have achieved far more than expected.

To sum up. ATP does not have the requisite personnel to effectively man the establishment. A close look at each department reveals deficiencies in both the number of skilled personnel and their skill levels in terms of foundation training and experience.

The interrelationship between resource constraints and technological capabilities at ATP is reflected in annual reports from the mills coordinator as to the constraints on his operations. These extracts from the 1982/83 annual report illustrate some of the problems.

- 3 months work loss due to lack of power
- spare parts unavailable
- inadequate supply of air (steam from powerhouse)
- for 6 months, mills used the wrong band saws and blades (because they had no alternative)
- two frames had practically no saws at most times
- poor log stock and poor species mix
- time spent in milling plymill cores for boilers (due to inadequate amount of sawdust to fuel furnaces; remains from logs

peeled for veneer have to be chopped into small pieces to be used as fuel)

- high labour turnover
- low labour force (at mills, not factory in general)
- slow response from engineering team when there was a breakdown
- having to feed good timber to boilers due to inadequate amount of sawdust.

On the engineering side, the engineering coordinator's annual report is nothing but a list of problems. Items that seem to feature in each annual report over the past 5 years include critical condition of furnaces in the powerhouse with brickworks falling apart and no appropriate cement to fix them, faulty compressors with bronze bearings, lack of lubricants, pumps needing overhaul without spares, knives and saws badly worn, and cracked cranes unwelded due to lack of electrodes.

A weak organizational structure, inadequate resource supply, and limited technological capabilities combine in such a way at ATP that even the most casual observer will not fail to conclude that the company does not possess adequate technological capacity to maintain functional operations.

Capabilities at MTC

The situation at MTC is quite different. No employee, expatriate or national, was affiliated to a multinational system. In 1984, out of the top 20 critical manpower positions, at least 15 had the requisite foundational academic training. Of the remaining five, three had qualifications no worse than their predecessors (Table 27). In other words, in terms of qualification and experience, it could not be said that nationalization resulted in a marked deterioration of the skill composition of personnel. In fact, in the accounting departments, the Ghanaians replacing expatriates have higher foundational training.

There is no need to examine each department at MTC as we did with ATP because generally the company is operating almost at its prenationalization level. The slight deterioration in performance for a few years has been attributed largely to external rather than internal factors. A point that calls for comment at this stage, because it will be an important feature in our discussion of alternative strategies within nationalization policies later, pertains to the engagement of expatriate staff.

The company, even after nationalization, has found the need to engage not only some of the prenationalization expatriates, but also, where these have left, to replace them from the world market. Most evident in the engineering and production divisions, this practice reflects the lack of technological capacity at the national level in strategic engineering personnel, especially heavy-duty engineers, for which no formal training exists locally. Graduate mechanical and electrical engineers can learn on the job, but this postgraduate apprenticeship has not been attractive to many young Ghanaian graduates.

Table 27. Comparison of personnel in selected positions at MTC, before and after nationalization.

Position	Prenationalization (1975)			Postnationalization (1984)		
	Basic qualification[a]	Years of experience	Nationality	Basic qualification[a]	Years of experience	Nationality
Managing director	PhD	3	Ghanaian	Trained in maintaining saws	27	German
General manager	Diploma	18	Swiss	FCWA	21	Ghanaian
Technical coordinator	Diploma	10	Swiss	Diploma	24	Ghanaian
Production manager	Trained in maintaining saws	12	Swiss	Diploma	18	British
Financial controller	Diploma	12	Swiss	FCCA	20	Ghanaian
Chief engineer	Diploma	12	Swiss	Diploma, BSc	12	Swiss
Deputy production manager	City and Guilds	16	British	BSc in Forestry	19	Ghanaian
Building engineer	Diploma	15	Ghanaian	Same person	24	Same person
Electrical engineer	Diploma	8	Swiss	Diploma	14	Ghanaian
Senior mechanical engineer	Diploma	5	Swiss	Technical certificate	26	Ghanaian

continued

Table 27. Continued.

Position	Prenationalization (1975)			Postnationalization (1984)		
	Basic qualification[a]	Years of experience	Nationality	Basic qualification[a]	Years of experience	Nationality
Senior transport engineer	Diploma	8	Swiss	Diploma	8	Swiss
Yard manager	GCE	23	British	MSLC	29	Ghanaian
Forest manager	BSc	10	Ghanaian	MSc	19	Ghanaian
Sawmill manager	City and Guilds	15	British	Diploma	14	German
Caterpillar engineer	Diploma	6	Swiss	Technical certificate	8	German
Transport engineer	MSLC	25	Ghanaian	Same person	34	Same person
Internal auditor	NA[b]	NA	NA	ACCA	22	Ghanaian
Chief accountant	ACWA	13	Ghanaian	ACCA	24	Ghanaian
Senior saw doctor	MSLC	17	Ghanaian	MSLC	25	Ghanaian
Training Instructor	Diploma	12	Swiss	Diploma	30	Swedish

[a] FCCA, ACCA, FCWA, ACWA are various professional accounting designations; MSLC, middle school leaving certificate; City and Guilds, British technician's certificate.

[b] NA, not available.

Source: MTC, unpublished records.

On the other hand, the company has been able to fill general management and financial positions adequately with Ghanaians. During a visit to the factory in January 1985, it was clear that the company needed only one more qualified accountant and about two engineers. A greater need was for more good technicians. It could be said with certainty that the company has a good capacity and that, given material support, it can maintain functional operations with its present staff.

Material Resources for Factory Operations

To what extent was the manpower situation at ATP and MTC further constrained by the state of machinery and equipment at the factories and by the supply of inputs, particularly spare parts, lubricants, and raw materials?

Machinery and Equipment

Two types of machinery and equipment must be distinguished: the first has to do with factory facilities within the respective mills; the second is heavy-duty moveable equipment for logging operations and transporting products.

In terms of factory machinery and equipment, ATP operates with older and more poorly maintained facilities than MTC. Both factories started producing lumber about the same time, in the late 1940s, but ATP has not added major sawmill equipment since then. MTC still uses its 1947 machines, but half the equipment at the sawmill was added later. The fourth and the latest of the four major lines was introduced in 1966. The profile board and veneer mills at MTC are almost new facilities, having been installed in 1970 and 1980 respectively. On the other hand, ATP's plymill is already 24 years old. Its newer lines, parquet finger flooring and systems building (dimension mills), are, however, post-1974 installations with fairly new machines. Unfortunately, both depend on the performance of the sawmill. The two lines were not in production at the end of 1984 due to the inability of the sawmill to feed them with lumber.

The state of the sawmill is the main determinant of technological capacity in both firms, because most of the other production lines depend on the output of the sawmill. All four major saws determining the production lines at MTC's sawmill are in good working condition as are the conveyors and resawing facilities. On the other hand, the two major band saws determining the production in the sawmill at ATP were set up in 1946. At least 50% of motors in the mill have broken down, saws are worn out, and rigs are being operated beyond dangerous limits. The differences in the state of equipment in the two establishments have to do with the availability of spare parts on one hand and maintenance capabilities on the other.

Availability of power affects the extent to which the machines can be operated. ATP is wholly dependent on wood-fueled steam turbines. The three boilers in the company's powerhouse supply power to meet all the requirements of the company: power for the production lines, hospital, residences, etc. Sufficient waste to fuel the boilers is generated if the sawmill operates at 60% of its capacity. The boilers also supply steam for drying veneer in the plymill and for other requirements such as heat application in gluing. One of the boilers blew up 2 years ago; the reason could be traced to technological incapability of the attendants. With the factory operating at about 10% of its rated capacity, not enough waste is being produced to feed the boilers leading to frequent shut-downs, up to four times in a single shift. These interruptions affect not only production levels, but also the state of equipment that is designed for continous operation. Fluctuating power levels cause motors to burn out. Inadequate power and wood led to the shut down of the plymill toward the end of 1984. The inadequate supply of fuel compounds the problem of deteriorating brickwork in the furnace which is causing undue leakage of heat.

MTC relied on electricity from four diesel generators until 1980 when a steam boiler was installed. The boiler generates steam for softening very hard wood for the veneer mill and for drying lumber for the profile board factory. It is also a major source of electricity for the factory. With the rising cost of diesel fuel and the fact that the factory produces more wood waste than it needs, the company is aiming at complete reliance on steam boilers for the generation of power.

To summarize, MTC operates with newer machinery and a more reliable source of power. But even where the age of equipment is comparable with that of ATP, it has been better maintained and there is better supply of spare parts and skilled personnel. In terms of the capacity of the facilities to sustain their intended levels of output, it is clear that ATP lacks the factory machinery and equipment, as at the end of 1984, to sustain production levels comparable to those prevailing in the mid-70s.

With regard to logging and other moving equipment, which is vital to timber operations, the contrast between the two firms is remarkable. As at January 1985, MTC owned at least 15 trucks, 10 caterpillars, four graders for road construction, seven forklifts, four timber jacks, three cranes, and four tractors. At least a third of its moving equipment was broken down for lack of spare parts. At the same time, ATP had only four working trucks to cart logs from the bush and none to carry them to the port, two working caterpillars, and one loader, a far cry from the fleet of 30 trucks and 15 caterpillars and graders before nationalization, most of which soon fell into disuse due to problems of maintenance and availability of spare parts. The differences in machinery and equipment explain to a large measure the disparity in the performance of the two companies.

Spare Parts and Other Supplies

Major machinery and equipment are bought to last for years. In the case of a sawmill they can last for decades, but their state will depend on availability of spare parts and other supplies such as lubricants as well as the quality of maintenance and operating personnel. The firms were faced with acute spare parts problems. ATP had practically no stock of spare parts, not even wire to tie timber for haulage. The company had hitherto not maintained a good stock of parts because a telegram to headquarters ensured needed supplies in a short time.

MTC's stock of spares was very high; that department is one of the busiest sections in the company. However, the company had to face the problem of having parts of certain kinds, but not enough of the ones regularly needed. This is partly the result of the foreign exchange situation which does not enable regular replenishment of stores. It is, however, costly for the company to maintain a high stock of spares. The company would be saved from tying up an undue amount of capital if the procedure for importing spare parts could be streamlined to enable quick ordering and delivery.

Another major problem facing the timber companies is supply of fuel and lubricants. The fleet of heavy-duty equipment, a good number of which have engine problems, demands a constant supply of engine oils, gear oils, petrol, and diesel fuel. Because of the country's economic problems, it has not been possible for the companies to obtain a regular supply of these vital inputs. Toward the end of 1984, MTC for example had to close down for a fortnight for lack of various oils especially diesel oil. ATP's operations have been interrupted several times for similar reasons even though, in this case, inability to purchase these inputs even in local currency is another major factor.

Managing with aged equipment, inadequate spare parts, and shortage of essential inputs will test the capabilities of the best personnel. When the technological capabilities of the personnel are also inadequate, a company is under serious constraints.

Conclusion

We have attempted an assessment of the level of technological capacity existing in the two nationalized timber companies in terms of institutional setup; material resources, especially plant and machinery and supplies; and in terms of the capabilities of their top 20 strategic personnel.

The review clearly shows that MTC had a balanced institutional framework to operate as an independent unit. This stems from the fact that it had always operated from Ghana not as a part of an international organization. On the other hand, the TNC subsidiary (ATP) can be described as a half factory. Not only were certain important services provided from overseas, but even at the local level certain positions were occupied by TNC-linked personnel, both locals and expatriates.

Both companies faced resource constraints in terms of aging machinery and equipment and lack of adequate spare parts and supplies, but the TNC subsidiary was in a much worse situation partly because it had not developed procurement capabilities. At the time of nationalization, ATP had no local stocks to serve as a buffer during the transition period. The parent company had always flown in parts as needed. Third, the local staff were handicapped by inability to make repairs because of undue reliance on replacement parts.

Examination of the skill levels within the firms also suggests differences between TNC subsidiaries and independent foreign operations in developing countries. The latter tend to recruit staff on their own merits, whose continued engagement depends solely on their service conditions and not on the ownership of the company. The result is that they (as represented by the case of MTC) are able to maintain skill levels after nationalization provided local conditions of service are not tampered with.

In the case of a TNC subsidiary, it appears that the degree of integration into the TNC system affects development of local technological capability. In our two case studies, ATP was more affected by nationalization because it was a mere production centre responding to plans set in London. the company has failed to develope adequate skill capabilities in almost all departments. Measured either in terms of foundational academic training or experience, the critical personnel in ATP are weak.

However, ATP national staff have met the challenges of resource constraints with a tremendous display of skills, beyond what would have been expected from a mere appraisal of qualifications and experience. At ATP, the average machine and replacement parts are being used for up to 50% longer than their normal lives through a series of modifications. This points to one conclusion: the performance of nationalized companies could have been better if technological capacity building, especially developing indigenous skills, had been taken seriously as a national priority. How far this factor has been neglected in Ghana's development and nationalization exercise is what we now turn to in chapters 10 and 11.

PRENATIONALIZATION EFFORTS TO BUILD TECHNOLOGICAL CAPACITY

10

In chapter 9 it was discovered that the level of technological capacity at MTC was sufficiently high to support the operations of the company. The evidence suggests that the degree of technological capacity building in a foreign company in a developing country will be a function of the type of foreign ownership, which in turn is a function of the degree of integration of a subsidiary into its multinational system.

Could the Government of Ghana have ensured the building of greater capacities before nationalization? What was the extent of technological capacity building effort before nationalization? In dealing with these questions, attention will be focused on transfer of technology with respect to increasing technological capabilities of nationals within foreign firms. In the first part of this chapter, overall national technological policies within which foreign enterprises operate are discussed. In the second, specific policies to ensure the transfer of technology in the enterprises under study, especially ATP, are explored in terms of formal agreements (if any), and their degree of implementation. Technology transfer during the transitional period, when the government acquired shares in the company, will be of particular interest.

Science and Technology Policy in Ghana

No explicit technology transfer policy existed in Ghana before 1981 (Adei 1983). Science and technology policy has been neglected in many developing countries. Initially it was assumed that importing foreign production systems under import substitution industrialization would ensure the acquisition of the underlying technologies. Everyone now knows that, because a factory in Accra is similar to one in London, does not mean Ghanaians have acquired the supporting skills and know-how.

Another illusion was that foreign investment implied an automatic transfer of capital, management, and technical know-how to the recipient country. Some capital transfer, which may be minimal initially and even negative in the long run, takes place and is usually accompanied by management and technical personnel. The essence of technology transfer, however, is not the location of factories in a country, but the acquisition of skills by the nationals of that country and requires a deliberate policy intervention in most cases. Such a policy would include defining the types or forms of technology to be transferred and the mode of transfer, monitoring the transfer, and developing local conditions necessary for effective transfer, such as general foundational education, monitoring institutions, local research institutions, etc. (See Thomas (1979), Bell and Hoffman (1981: 165-196), and Westphal et al. (1981) for discussion of technological capacity development.)

A review of the technology policy in Ghana by Adei (1983) reveals the following characteristics of the existing policy and technology transfer infrastructure. There is no effective central government machinery to draw up science and technology policies or to implement them. Intentions have not been wanting. For example, the Ministry of Industries was renamed Ministry of Industries, Science and Technology; it has not substantially changed how business is done, however.

Technology transfer agreements are largely private affairs between the seller of technology and the buyer. The Bank of Ghana's foreign exchange department has to approve the agreement, but this is mainly for registration purposes to allow for the transfer of currency. The technology to be transferred is not itself an issue in dispute. The Registrar General's department registers all patents and trademarks but, again, the exercise is to ensure that no double registration occurs and also to establish the credentials of the patent holder. The Capital Investment Board (later Ghana Investments Centre) and the Ministry of Industries undertake project appraisals before issuing industrial licences or awarding concessions. But an examination of the criteria of approval reveals concentration on financial viability and avoidance of undue duplication of projects. This was the situation before the new Investment Code was passed in 1981.

The major technology transfer effort, therefore, has been an attempt by the Ghana Investments Centre and the Ministry of Interior to limit the employment of expatriates to "essential technical persons." In practice, many pass this test, but the provision is significant in that it limits employment of expatriates to functions which require skills that are deficient in Ghana. The Aliens Act of 1963 (Act 160, Section 10.1) states, "No person shall employ any alien in Ghana except in accordance with a licence in writing granted by the Ministry of Interior." Further, a GHC 5000 per annum tax is levied on each alien employee under a Selective Alien Employment Tax Decree (NRCD 201) unless such an employee has been exempted.

In terms of setting up local research and development institutions, Ghana made a lot of progress in the 1960s. Since then, the economic decline has worsened the facilities available to these establishments. Two universities, one specifically to train engineers and scientists, have been established since independence; one university existed before then.

The most notable step was the establishment of a Council for Scientific and Industrial Research (CSIR) in 1959. CSIR now comprises 10 institutes undertaking pure and applied research. Their areas of concentration are indicated by their names: Animal Research, Building and Road Research, Crop Research, Food Research, Industrial Research, Aquatic Biology, Soil Research, and Water Resources Research institutes; Oil Palm Research Centre; and Scientific Instrumentation Centre.

The impact of the CSIR on the economy has been quite minimal due to a number of factors among which are lack of adequate material support, lack of skilled personnel, and the perennial problem in developing countries of transferring research to industry. This is where the setting up of the Technology Consultancy Centre within the University of Science and Technology in 1973 marked a major step forward. The Centre seeks to transfer research findings to the level of ordinary artisans and entrepreneurs and to help them establish viable industries. The result of their work is already being felt in such areas as small-scale industries and farming. These include palm oil plantations, oil mills, soap plants, engineering workshops, and weaving enterprises.

The State Enterprises Commission was set up in 1976 to provide technical audit and consultancy services to state enterprises. But technology transfer and development in state-owned firms were not even mentioned in the establishing decree.

With respect to the transfer of technology from TNCs to nationals, two major institutional efforts were made in 1981. The government set up a Technology Transfer Centre (TTC) with the following functions: to identify Ghana's technological needs, to select technologies for Ghana, to unpackage imported technology, to advise government on technology related issues, and to promote effective technology transfer (Adei and Nyakotey 1982). To date, the TTC remains a one-man department with no relevance to day-to-day occurrences in the business world.

The other step was the promulgation of new investment legislation, Investment Code 1981. The Code for the first time appointed the Ghana Investments Centre to be responsible for the approval, registration, and monitoring of technology transfer agreements. Four months after passing the legislation, the government was overthrown and it took a while before interest in promoting foreign investment became an important national issue again. The Centre was crippled by the absence of an effective board of directors and a substantive chief executive. Once again the intentions have not materialized into an effective policy to date.

The urgent need for an effective technology transfer policy in Ghana, backed by the necessary institutional arrangements, cannot be overemphasized. At the time of writing, another Investment Code had been drafted which makes the Ghana Investments Centre the focal point for transfer of foreign technologies.

What is the consequence of lack of science and technology policy and critical institutional supporting machinery? There is no guidance as to unacceptable clauses in technology contracts that are legally binding; there are no clearly laid down limitations on the duration of contracts; local content stipulations are nonexistent; almost any foreigner can be hired if the employer can prove that it has been difficult to get a local equivalent; and monitoring of contractual obligations is nonexistent.

The contribution of technology policy in ensuring increased national advantage is an issue seldom acknowledged by developing-country governments. The result of banning the export of 14 primary species of timber in log form in Ghana, in 1980, should carry an important lesson. It has resulted in increased processing of timber in Ghana, at least into lumber with additional value-added gains. The impact of this policy, however, has been constrained by the fact that it came at a time when the country was in her severest economic difficulties and could not service the industry.

How did TNCs respond to the laissez-faire technology policy in Ghana? As stated in chapter 9, MTC responded to the demands of operating an efficient company from Ghana. All the institutional and material resources needed for running the establishment were acquired within the constraints of a rather harsh economic climate. Local high-level personnel were recruited. There was still dependence on foreign employees, even for some functions that could be adequately performed by local personnel. This was particularly clear in the finance department where qualified nationals had to work under expatriates. The philosophy seemed to be that, if expatriates were put in charge, nationals would work better under them. That is not to deny that, in certain areas especially the engineering department, there existed serious deficiencies in national capabilities. Even after nationalization, the company has had to employ six or seven expatriates at a time. Although this represents a marked improvement on the prenationalization situation (when up to 17 expatriates were employed), it underscores the fact that there were genuine technical reasons to engage some of the expatriates.

Apart from the attitudinal problem of the expatriate owner preferring to place expatriates in key positions, there was very little evidence of a deliberate policy not to transfer technology to nationals. We cannot, however, rule out a situation where an individual expatriate, fearing for his own position, may have refused to impart his skills.

We noted in chapter 9 that ATP, as a former subsidiary of a TNC, presents a different picture. ATP Ghana did not have sufficient institutional machinery to discharge all the functions of an independent operating unit. Even in terms of material resources, the company did not keep sufficient stocks of spares locally so long as it could fly in needed inputs from its headquarters. The main deficiency, however, was in the engagement and training of nationals with the requisite foundational academic qualifications and experience. The nationals in the company did not have the necessary capabilities or the resources to maintain a functional organization. Left to itself, the TNC did not transfer technology except where it was economical.

Technology Transfer Under Joint Ownership

If the macro-environment within which TNCs operated in Ghana did not promote the effective transfer of technology, one would expect a different situation to prevail when the state had an equity interest in a foreign company with representation on its board of directors. In this section we shall examine the period of joint ownership of the companies (1972-76). We will concentrate on ATP because there was no substantial change in technological capabilities with government participation in the case of MTC. The focal point of our review of technology transfer during state participation will be the technology transfer agreement the parties signed.

As a wholly owned subsidiary of a British company (UAC) operating in a country that had been a British colony when the company was established in 1946, ATP needed no technical or management agreement with the government. The company was owned and managed by UAC which received all commercial returns.

The need for a formal agreement arose when the government took 55% of the shares in the company in late 1972. A management agreement was signed by the government and UAC whereby UAC provided technical and management services to ATP for a fee. The agreement was to ensure that ATP "has an organization which provides for the management of African Timber and Plywood (Ghana) Limited to be carried out in a workmanlike and commercial manner in accordance with good engineering and industrial practice." The services to be rendered by UAC's timber division comprised the following:

- A buying service that would locate suitable sources of supply; negotiate competitive prices that would take advantage, where possible, of benefits available to ATP as part of UAC International Limited group of companies to buy in bulk; place and process orders; attend to all shipping arrangements; deal with claims; and advise on the training of staff.

- Advice and guidance on engineering development and technology relating to selection and installation of plant, machinery, and spare parts; design and improvement of plant and machinery; selection, recruitment, and training of technical staff; and maintenance and overhaul of plant and machinery.

- Advice and guidance on product development, research, manufacturing, and selling techniques relating to research, development, and evaluation of new and existing products and methods; research and development of adhesives, protection against attack by insects and fungi, and all other materials and processes used in manufacturing; quality control; maximum utilization of Ghanaian timber species; market research; information on development in the timber trade; and control and prevention of pollution.

- Advice and guidance on forestry relating to extraction and logging, storage, and transport techniques.

- The results, in relation to all the above services, of practical experience gained in other timber operations with which UAC was connected.

Because UAC was a shareholder in the firm, the following implications of the agreement emerge. Certain functions were considered by the parties to be incapable of being fulfilled by Ghanaians and UAC had special knowledge that it would offer to a subsidiary, in which it had no majority interest, at a premium. Some services, which hitherto were offered to the company without explicit charges, would now be paid for because ATP was to operate as an entity outside the UAC group.

It is interesting to note that all the important technological decisions in the company were, by the above agreement, given to UAC. Within the firm, the five key positions were to be filled by UAC - Managing Director, Production Coordinator (overall plant manager for all the mills), Chief Financial Officer, Chief Engineer, and Chief Officer in Charge of Forest Operations. There were no specific provisions or schedules for the training of Ghanaians to perform these functions. UAC International was obliged to submit to ATP's Board of Directors a training scheme for its Ghanaian staff that would enable Ghanaians to replace employees within a reasonable period. The Managing Director was to implement the approved scheme at ATP's expense. The implementation was not undertaken. The government as the majority shareholder did not have an explicit veto on these matters.

The agreement was to last for 5 years, subject to renewal if both parties agreed. The company was, however, nationalized in 1976, a year before the end of this period. The nationalization of ATP (as well as MTC) was not negotiated; the government simply announced the takeover promising compensation, which has never been paid.

The technology transfer implications of the above management agreement are quite serious, especially when advice was to be given. Because key positions were held by UAC appointees, it was tantamount to UAC advising itself. Leading technological functions were contracted out to UAC thus limiting any technology transfer.

The institutional deficiencies that existed before the state acquired shares were not rectified during the participation stage. By not insisting on the development of local capabilities for export marketing, acquisition of inputs, and major technical functions in the company, the government undermined the chances of ATP's developing the prerequisites for effective nationalization. Worst of all, there is no evidence that the government monitored the implementation of the agreement.

State participation did not improve or accelerate the transfer of technology at ATP. All evidence points to a deterioration of the firm's technological capacity. The rhetoric that accompanied the acquisition of majority shares was sufficient to warn any TNC of imminent nationalization. Under these circumstances, the factory was allowed to run down and only minimal and superficial services were kept at the subsidiary level. Interviews with leading personnel in UAC's International Timber Division indicated that UAC was still interested in ATP as a minority shareholder as long as it had control over its management. This might have prevented the deterioration of the factory, but local staff remaining at the firm are fully convinced that the untimely nationalization deprived them of a complete refurbishing of the factory, for which plans had been made. Some even believe that major machinery and equipment were in transit when the company was nationalized. For our purposes, the most important issue is that government participation was not used to build local technological capacity, especially in the sense of transferring know-how to nationals.

Conclusion

The foregoing appraisal of prenationalization technological capacity building effort in Ghana reveals the following features:

- No systematic and comprehensive science and technology policy existed.

- Technology transfer was largely regarded as a private affair. The national consideration tended to be limited to financial implications of technical and management contracts.
- Even where the government went into partnership with TNCs, no attempt was made to explore the bargaining position of Ghana. Instead, the country literally surrendered its rights to acquire the necessary know-how by asking the TNCs to be fully responsible for technical management, acquisition of all foreign inputs, and engagement of expatriates to fill almost all the technologically sensitive positions.

The prenationalization technological building effort in Ghana was very weak and anything done by the TNCs by way of technology transfer was either incidental or unavoidable.

Nationalization is likely to have a negative effect on local capacity in TNC subsidiaries, even if adequate capacity existed before state takeover, as a result of withdrawal of services, such as the acquisition of supplies, troubleshooting, and overseas marketing, by company headquarters. Nationalization may also lead to the withdrawal of expatriate personnel from the firm. To the extent that TNCs limit certain key functions to their headquarters or delegate them to expatriates, a vacuum is created. Even local technologists, it may be recalled, cannot be relied upon to remain in the company. There is, therefore, the need, not only to make good the lack of development of indigenous capacity by the TNC, but also to overcome the adverse impact on company performance.

In this chapter, information is collated on the impact of nationalization on African Timber and Plywood Limited (ATP), and Mim Timber Company (MTC) and efforts by the government and the management of the respective companies to build up technological capacities in the firms are examined.

Institutional Structure

Nationalization has not resulted in any significant change in the institutional framework of the companies. Rather, it revealed weaknesses that existed within the organizations when they were expected to operate as independent entities. Subsidiaries to TNCs are designed to operate within a family of interlocking branches of the parent establishment. The greater the degree of integration of the subsidiary, the weaker the branch.

In the case of MTC, nationalization had no serious adverse effects; ATP, on the other hand, is not exporting, partly because this function had been organized from London by UAC. The company also operates with a weak finance department that is suited to a branch of a TNC, but not to an independent operation. The abysmal level of effort to restructure ATP, in particular, after nationalization indicates that technological considerations have been neglected in Ghana's nationalization program.

Material Resources Supply

For ATP, nationalization meant the stoppage of all UAC supplies including spare parts and foreign inputs. In other words, all functions assigned to the TNC under the management agreement (listed in chapter 10) ceased on nationalization day. One result of this has been an acute shortage of spare parts and imported inputs which has contributed to the reduced technological capacity described in chapter 9. The fact that alternative arrangements were not made confirms the view that technological capacity considerations were minimal in the decision to take over those ventures.

Nationalization adversely affected the supply of material resources to ATP in several ways. Under TNC management, the parent company would send supplies prior to payment by the subsidiaries, with confidence that the management would not default. A review of the import licence allocation to the companies (Tables 23 and 24) indicated that the amount of foreign exchange allocated to the companies by the government was better under foreign management too. There is no doubt that the overall worsening of Ghana's foreign exchange position since 1975 is the major explanatory factor here. In the case of ATP, however, the inability to export is an equally important factor.

Quality of Personnel

By far the most important effect of nationalization had to do with its impact on skill composition of personnel in the firms, especially ATP.

Functions Performed from Overseas

The degree of expertise of nationals employed with TNC subsidiaries will depend on what functions are undertaken outside the company. The following services were performed for ATP by UAC (London).

- Research and development. UAC itself does very little research of its own, but rather makes contributions to British research institutions which share the results with the company.
- Marketing of products and receiving orders. ATP was producing in response to plans and marketing programs of UAC's timber division, selling under its trade name Cresta.
- Specifications. Product specification and production schedules were all set in London. ATP merely produced to order.
- Acquisition of supplies. Raw materials, especially glue for the plymill, spare parts, etc., and major plant machinery and equipment were obtained by the parent company.
- Troubleshooting services were provided in the areas of forest operations, production, and engineering.

Positions Held by Expatriates before Nationalization

The following positions at ATP were held by expatriates: managing director, chief engineer, production coordinator, sawmill and plymill managers, sawmill yard superintendent, mechanical engineer, electrical engineer, power superintendent, transport engineer (forest), supplies department head. It is quite clear that, coupled with functions undertaken from abroad, expatriates holding these positions reduce the opportunity for nationals to acquire technological capabilities for the performance of key functions in the companies. This became aggravated where weaknesses already existed in the basic qualifications of nationals employed.

The exposure of nationals to documents and product specifications, as well as in-service or external training, also determines the rate of capability building. Ghanaian involvement in the setting up of ATP was minimal. To date, the management of ATP has no knowledge of the details of technical drawings of the factory. A few of the staff have visited headquarters; but except for that of the mills co-ordinator, visits have been very short (less than 3 months). Senior personnel improvement programs have, therefore, been inadequate. However UAC had an excellent basic training in engineering for artisans. Most of the engineering departments within the firm are being manned by graduates of this program.

It can be said that nationals were never trained to acquire all the capabilities to run the factories successfully. This should not be taken as an indictment against TNCs. It is consistent with the desire to retain oligopolistic control over a subsidiary by a parent company. The onus rests on the host country to ensure the acquisition of technological capacity by nationals through effective technology transfer policies. This is what Ghana missed in dealing with foreign firms both before and during the participation stage. Nationalization, therefore, affected the situation adversely with the departure of the foreigners.

The government presumed that, because Ghanaian companies were operating alongside expatriate firms like ATP, the country had the capability to run the firm. Even if that were true, the task of redeploying people has to be undertaken. The Government of Ghana, desiring to gain the commanding heights of the economy, did not consider the state of technological capabilities on nationalization. UAC was prepared to provide technical management services for a fee, but this offer was rejected.

The author is of the view that the country has the capacity to run ATP successfully. The timber industry is the largest manufacturing sector in the country and comes third, after agriculture and mining, as the main export earner. Besides the four leading companies nationalized in 1976, there are literally hundreds of medium- and small-scale foreign (joint ventures only since 1972), state, and Ghanaian private operators. Even though the country is short of certain skills, especially those of heavy machinery engineers, they could be hired easily on the international labour market.

This theory is amply illustrated by the case of MTC, which was successfully operated by the expatriate owner before nationalization by assembling a core of local and expatriate skilled personnel, a policy which has been continued since nationalization. The only problem is the laissez-faire attitude of the government toward the building of technology capacity which means that ATP, starting with a handicap so to speak, continues to be disadvantaged.

Loss of Local Technologists

There was no guarantee that locally trained personnel would remain with the firm on nationalization. At ATP almost all of the few Ghanaian graduate personnel have left since nationalization. Those who have remained are middle-level technicians who, by staying, have attained positions far above what they could get in other sectors of the economy. UAC had not been successful in retaining local graduate employees for long periods either.

Because of its importance to the operation of ATP, the investigation centred on the engineering division. Between 1972 and 1976, (the period of joint management), the company had an average of five graduate-level Ghanaian engineering staff. Since nationalization, they have all left the company. Nationalization, therefore, had a negative impact on the technological capacity of the firm as a result of the departure of both expatriates and local personnel.

Postnationalization Effort to Build Technological Capacity

The services, performed by the TNC from overseas and by expatriates within the firms, that ceased on nationalization had to be replaced. In the case of ATP the needs were of two kinds. First, labour with the requisite know-how, from local and international markets, had to be engaged. MTC did this before nationalization and has continued since. The second need is the provision of capital for replacing machines and the supply of essential consumables. On both counts very little has been done since nationalization.

With such a low emphasis on technological consideration in the decision to nationalize, very little could be expected. There was inadequate valuation of assets, stock levels, and manpower. In other words, it was a takeover of assets without counting the cost in terms of responsibilities.

ATP needs recapitalization to refurbish its plants and to ensure a regular supply of spare parts and raw materials. In 1981, a UAC review of the company estimated the rehabilitation cost to be in excess of GBP 13.9 million in foreign exchange, of which immediate spare parts requirements and 1-year inventory needs alone totaled GBP 463,118 (in 1981, 0.52 pounds sterling [GBP] = 1 United States dollar [USD]). However, the government has not made any capital investment of substance in the company since nationalization. Between 1977 and 1983 the government advanced loans totaling GHC 15 million to the company (Table 28). These loans, half of which came 6 years after nationalization, came too late and only in response to crisis situations. They were local currency loans with no foreign exchange backing. The result is predictable: they have not changed the basic problems of the company and cannot be repaid unless new investments are made.

Table 28. Government loans to ATP since nationalization.

Date of loan	Amount (GHC)	Duration (years)	Interest rate (%)
1977	5000000	-	11.5
1982	2500000	10 (plus 5 years grace period)	2.5
1982	2500000	10 (plus 5 years grace period)	2.5
1983	5500000	5 (plus 2 years grace period)	9.0

Human Resources Development Since Nationalization

Since nationalization at ATP, little effort has been made to provide training programs to upgrade the skills of employees. Nor could it be said that any aggressive effort has been made to attract skilled personnel from other sectors of the economy. This is particularly strange in the case of ATP because the country has several other companies operating in the industry.

Both ATP and MTC had excellent artisan training programs that provided basic training in all of the engineering skills needed by the firms. Since nationalization, ATP's training school has been closed. In fact, the company started winding up the training program when government took majority shares. In the case of MTC, the school was not closed, but the training program was trimmed down for lack of instructors. Toward the end of 1984, a foreign trainer was engaged under a World Bank assistance program.

Conclusion

There is no doubt that the government, as shareholder of a nationalized industry, is to blame for the above situation. It has been the responsibility of the government to appoint directors of the companies. The key position of managing director (MD) has been politicized in both companies. Even at MTC, at the time of writing, the MD had been interdicted, suspended, and reinstated amidst a political row. Civil servants, who actually look after the company for government, have generally not taken kindly to improvements in conditions of service in the companies because the employees' salaries are generally higher than those of comparable positions in civil service. The state must provide rehabilitation funds and other resources needed for the efficient running of the factories.

The review of the impact of nationalization on technological capacity in ATP and MTC leads to some conclusions. First, nationalization adversely affected the supply of inputs to ATP and the skill composition of employees. Second, the personnel in the firms, notably ATP, have to operate with an institutional setup designed to be dependent on a parent organization that is no longer there. On nationalization, therefore, the government had the responsibility to make good these deficiencies before expecting results. Unfortunately postnationalization effort has been next to nothing. The relatively better situation at MTC is simply due to the fact that it was more independent before nationalization.

AN EFFECTIVE NATIONALIZATION POLICY FOR DEVELOPING COUNTRIES

In this concluding chapter, the case studies of the two nationalized timber firms are summarized. Some of the strategies open to developing countries for dealing with subsidiaries of TNCs operating within their borders are reviewed. Policy recommendations are made for an effective nationalization program, including how to salvage those firms already nationalized.

Summary of Evidence

The performance of the nationalized companies, ATP and MTC, has varied markedly. In terms of production level, capacity utilization, productivity of factors, financial performance, sales (both local and foreign), profitability, and employment levels, differences existed between the companies. In general, the performance of ATP has been disappointing while MTC has been able to maintain prenationalization performance levels.

Exogenous factors, such as government price controls, overvaluation of the Ghanaian currency, shortage of foreign exchange, the state of economic infrastructure, emigration of trained personnel in the face of economic decline, and bureaucratic interventions, affected the companies in Ghana to varying degrees. The timber firms were adversely affected by the overvaluation of the cedi (insofar as their ability to export was concerned), lack of trained personnel especially of the engineering class, poor state of economic infrastructure, and administrative intervention by the government and its agencies.

The relative performance of ATP and MTC, who were faced with similar external constraints, cannot be attributed to exogenous factors. Examination of technological capacity at the firm level revealed differences between the firms that largely correspond to their relative performances.

The greater the integration of the subsidiary into its parent company, the greater the deficiency in the institutional framework inherited on nationalization. ATP in particular had no vital departments, such as marketing and exporting. Even the accounting division had been nothing more than a bookkeeping unit and planning and scheduling had been received from London. MTC, on the other hand, had been structured to operate as an independent unit.

The differences in institutional structure were paralleled in material support. Control by the parent TNC meant that vital inputs were sent from headquarters on demand. No substantial stock of spare parts or other inputs was kept locally. Even the infrastructure to acquire such inputs was not developed.

The greatest differences in technological capacity between the companies were manifested in the skills and know-how of indigenous personnel. The TNC subsidiary was characterized by inadequate employment of Ghanaians with the requisite foundational training and experience. This was due to the fact that key functions were undertaken by the parent company. Expatriates were engaged for strategic functions in the firms, especially for the position of chief executive, leading engineering and production positions, and financial comptroller.

The evidence reveals a clear association between the development of technological capacities, especially those relating to skills of indigenous personnel, and the type of foreign ownership. MTC, which was not a subsidiary of a TNC, had greater development of indigenous capabilities. ATP, on the other hand, was a mere production wing of UAC's international timber division and lacked local people with the requisite educational background and experience to maintain functional operations in the long run.

Nationalization had an adverse impact on technological capacity in the firms. Once again, the degree of the impact depended on the degree of prenationalization dependence of the subsidiary on the overseas parent. On nationalization, offshore services rendered by UAC were cut in the case of ATP. MTC had no such problem because it operated as a full unit from Ghana. Expatriate employees and even local technologists at ATP did not remain after nationalization.

Nationalization, therefore, resulted in the creation of a half-factory at ATP, which needed recapitalization, redeployment of personnel and engagement of new people, and even institutional reorganization. Failure of the government to build technological capacity in nationalized firms constitutes the major explanatory factor in the performance of the companies.

An examination of prenationalization technological capacity building revealed that no systematic or comprehensive policy existed in Ghana to ensure the effective transfer of technology by TNCs. Technology transfer was largely considered to be a private affair. National consideration was limited to the short-term financial obligations in foreign exchange involved in the transfer of fees and charges under technology contracts.

The almost haphazard approach to nationalization in Ghana was further evidenced during state equity participation in the companies before nationalization. The state did not take advantage of its joint venture with the TNCs to expedite the transfer of technology to Ghanaians. Instead, the foreign companies profited more from the state collaboration in the form of guaranteed loans and official incentives.

Nationalization of the companies was undertaken with very little thought given to the technological capacity to run the firms successfully. The apparent success of MTC is only incidental and is due to the fact that it has never been a subsidiary of a TNC. It is against this background that alternative approaches to TNCs operating in developing countries are examined and possible strategies for making the nationalized companies function effectively are suggested.

Strategies Toward TNC Subsidiaries

There are options open to a host country for increasing its national economic advantage without equity participation. Developing countries must explore and take advantage of these. They include formulating science and technology policies with emphasis on effective technology transfer to ensure that maximum benefits are derived from TNC subsidiaries. Such policies will include disallowance of certain prohibition clauses in contracts that militate against the transfer of technology; regulation regarding the employment of aliens and training of nationals for certain positions within a specified time; establishment of the institutional machinery to select, import, impart, and assimilate imported technologies; and development of indigenous capacities. (For discussions on ensuring effective technology transfer, see UNCTAD (1972, 1975) and Patel (1979).)

Another exercise is monitoring transfer pricing and other intrafirm dealings among TNCs and their subsidiaries. Although it may be difficult for any particular country to monitor the activities of TNCs, scope exists for acquiring basic knowledge about the international markets which could be used to verify data submitted by TNC subsidiaries to government agencies. (See Lall (1973) and Vaitsos (1973) on the prevalence of transfer pricing and how it is effected.)

An institution to oversee technology transfer (importing, imparting, and assimilating foreign technologies) would be a minimum starting point. At least all major technology transfer contracts entered into by the government should be monitored. In the early 1960s, Ghana sought to levy tax on repatriated incomes. The present policy of approving every expatriate employee in Ghana is another strand in an implicit technology transfer policy in the country. These must be incorporated into an explicit and well worked-out policy. Attempts to do so under the Investment Code of 1981 are commendable but inadequate.

A second approach is for nationals (both the state and private persons) to enter into joint-venture partnership with foreign operations. It has been observed, however, that, even where the state owns shares, there is no guarantee that there will be an effective transfer of technology. In fact, state participation can be used as a cover to achieve enhanced economic advantage for the TNC. In other words, national equity capital may work for the interest of the TNC. National equity participation is therefore not a substitute for a policy and institutional framework for the transfer of foreign technologies and development of indigenous technological capacities. However, equity participation allows access to inside information on company operations, influence in the appointment and training of personnel, and advancement of national economic interests.

The world, even in mature capitalist economies, has come to accept nationalization as a right of the state.

> The actual transfer of ownership of direct foreign investments (DFI) to nationals may be through outright confiscation, partial compensation or by adequate economic compensation. The mode of

> achieving economic nationalism is an important determinant of the cost of any such programme. If assets, the subject of DFI, are not confiscated, there is an added burden of transfer of capital. There is also the opportunity cost of committing resources to the purchase of on-going business instead of using it to expand productive capacity. Operational efficiency of the firms may fall too. Its effect on inflow of future DFI when needed may be catastrophic. Given that DFI usually comes in a package of finance, technology and managerial resources, the economy could lose most of the other benefits tied with foreign ownership. (Adei 1980: 2)

The essence of the above quotation is that even if nationalization is by confiscation, as it amounted to in our case studies, the cost of nationalization can be enormous in terms of financial, technical, and managerial requirements needed to operate the companies. Even without deliberate retaliation on the part of the TNC or its home country, nationalization immediately puts some obligations on the state. These include ensuring adequate capitalization of the firm; ensuring that people with the requisite know-how and skills are employed including an effective Board of Directors; and holding management accountable for firm-level performance. The state has now to perform the duties of a sole shareholder.

With respect to capitalization and ensuring that sufficient resources are available for running the enterprise, the state has a dual responsibility. The first has to do with providing recurrent resources and inputs hitherto supplied from overseas by the TNC, such as spare parts and raw materials. The company on nationalization day may not be in a position to meet these recurrent expenditures simply because, within the subsidiary, there would not have been provision for that. Second, the state has to provide money for new capital equipment if necessary because an adequate depreciation fund may not exist. The continued use of historical cost as the basis for company accounting in Ghana implies that even if such a fund existed it would still be impossible to replace equipment from it.

Besides the local currency cost required for equipment, spare parts, and other inputs, there is also the need for hard currency to back acquisitions. TNC subsidiaries often receive inputs from parent companies long before local arrangement is made for reimbursement. The government must provide the necessary foreign exchange as and when needed by nationalized firms. That the state has the resources to meet these demands cannot be questioned even in the poorest nations. They may come from the company's own foreign exchange earnings or through foreign aid, but there is no guarantee that the funds will be made available to the nationalized firms. The basis of doubt stems from the fact that, due to inadequate technical appraisal of the situation, the extent of the problem may not even be appreciated. Instead, every demand is likely to be analyzed through political spectacles.

Ensuring that technological capabilities are adequate is another prerequisite to the successful running of a nationalized firm. This will go hand in hand with institutional reform because certain vital functions, which were performed overseas, have to be localized. Several options are open to the nationalizing country, beginning with every attempt to retain as many of the local technologists as possible. This will require maintaining their relative economic positions in terms of salaries and other benefits.

Vacant positions created by expatriates and local personnel who may leave and new positions created to offset services no longer available have to be filled. In cases where national capacity exists, a serious redeployment exercise has to be undertaken. Often deputies in analogous organizations may be able to fill the positions effectively. Where the nation lacks the capability, such as heavy-duty engineering in Ghana's timber industry, the country may hire appropriate personnel from the international market. A technical agreement may be necessary. In an industry like timber processing, the possibility of hiring individual experts from overseas has been amply demonstrated by MTC.

The case of MTC shows that accountability of management to politicians in the operation of state-owned firms is possible. A problem arises when the TNC subsidiary is so weak in terms of organizational structure and technical capabilities that political intervention may have disastrous consequences. There is always a risk that nationalization may lead to overpoliticization of vital decision-making processes within the firm. This price of nationalization cannot be overlooked: the cause of the failure of nationalization may be the politician.

Salvaging Nationalized Firms

Although they may be out of date when this study comes out, some suggestions as to what can be done in the case of ATP follow. The rapid deterioration of operations at ATP means one can only restrict oneself to general prescriptions.

The government must accept the fact that it did not nationalize a functional organization. What was acquired was a factory deficient in vital departments, adequate technological capabilities, and resources with which to operate. The company, however, is directly responsible for sustaining economic activities in a whole district by providing socioeconomic services for an area of 32-km radius. The state, by nationalizing the company, became directly responsible for maintaining not only the company, but also a rich agricultural district.

The company requires an injection of capital in three forms. First, ATP's total indebtedness of nearly GHC 130 million (mainly to the government and its agencies) has to be written off or paid. Second, a substantial amount of not less than GBP 15 million in foreign exchange (UAC 1981) will be needed to rehabilitate the firm including the production system, boiler house, and movable equipment such as trucks, tractors, and caterpillars. The third need is operating capital. Irrespective of what has gone on before, the company cannot maintain functional operations without recapitalization. The government must provide the necessary financing from its own resources or through international aid. Alternatively, the government could invite private equity participation (both local and foreign) in which case UAC, the former foreign shareholder should be among those considered. Even with outside participation, the huge debts of the company, largely the result of paying redundant labour, cannot be capitalized. In fact, there is another problem of benefits to employees, a problem which may be solved by liquidating and forming a completely new company because the assets of the company are too meagre to meet its liabilities.

Any massive capital injection requires simultaneous engagement of technical personnel to run the organization. A specialist marketing officer, one or two qualified accountants, and three engineers would be a minimum addition of core skilled manpower to start with. These have to be engaged from the national or international labour market. This may be accomplished practically if nonstate equity participation is accepted from a group with the requisite human resources. An independent and competent board has to be instituted. Although the idea of an independent board may sound contrary to the spirit of nationalization, this need not be the case. ATP cannot be said to be a strategic company in terms of national security. The production of lumber does not fall into such a category. Instead, its major contribution to the economy of Ghana lies in three areas: earning foreign exchange; employing nationals in an area where the company is the only source of nonfarming employment; and providing essential services such as health, electricity, water, and, by far the most important, a network of motorable roads to a rich farming community. Its actual contribution in terms of company taxes, which totaled less than GHC 5,000,000 over a 15-year period (1970-84), is not significant. The above-mentioned major contributions by ATP come only when profits are generated in conventional private accounting and economic terms. It is the view of the author that the failure to relate the profitable operation of ATP to the external benefits generated by the company accounted for the haphazard manner in which nationalization was undertaken.

MTC's future seems secure without much help from the state. The company has adequate dynamic technology to solve its problems, which include engaging several more engineers and a financial accountant.

Conclusions and Policy Implications

The core factor to be considered in nationalization is technological capacity to run the companies. The level of indigenous technological capability and of the supporting infrastructure will depend on prenationalization technological capacity building effort in the country. But a static estimate of indigenous technological capacity at the time of nationalization is no guarantee of success because nationalization will have an adverse impact on any existing capacity. The ability of the country to build such a capacity after nationalization is the real test of the ability to carry out a successful nationalization program.

One cannot build strong policy recommendations around two case studies. However, the following implications and recommendations do suggest themselves from the study of ATP and MTC and are presented as hypotheses for further investigations.

Nationalization does not automatically ensure that the nation will benefit more from the operations of a company. In fact, the nation may be worse off. It is, therefore, important to evaluate alternative modes of sharing in the company's real income, such as monitoring of companies' activities to check transfer pricing and national equity participation in TNC subsidiaries.

Benefits from the operations of TNC subsidiaries can be enhanced by an appropriate science and technology policy to ensure effective transfer of technology. Unfortunately most developing countries do not have such a policy, let alone an effective institution to ensure importing and assimilation of foreign technologies and development of indigenous ones. A national science and technology policy is a prerequisite for ensuring maximum benefit from TNC operations in developing countries.

When a decision is made to acquire foreign shares, there is a need for a thorough appraisal of companies' assets, human resources, organizational structure, etc., before nationalization. The appraisal can often be undertaken by a government agency responsible for monitoring company operations in the country. In Ghana, the Central Bureau of Statistics or Ghana Investments Centre can be such an institution.

Nationalization implies a change of ownership and carries certain responsibilities which the state must be willing to shoulder. These include adequate capitalization of the firm, engagement of technologists, and establishment of an effective organization. These responsibilities tend to be greatest where the company was a TNC subsidiary simply because TNC subsidiaries operate as half-factories with the other half often located outside the country.

Of all the responsibilities of government, the development of technological capabilities in the nation seems to be the most crucial. The examination of technological capacity in two nationalized firms in Ghana leads to one message: nationalization without assessment of technological capacity is a national risk which may not be worth taking. Nationalization programs in developing countries must have a well thought out technological development content.

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ACRONYMS USED IN THE TEXT

AFRC, Armed Forces Revolutionary Council
ATP, Africa Timber and Plywood (Ghana) Ltd
ATPN, Africa Timber and Plywood (Nigeria) Ltd
CSIR, Council for Scientific and Industrial Research
GBP, British pound sterling
GDP, gross domestic procuct
GHC, Ghanaian cedi
GNP, gross national product
GNTC, Ghana National Trading Company
GTMB, Ghana Timber Marketing Board
GWA, Gliksten West Africa, Ltd
IDRC, International Development Research Centre
MTC, Mim Timber Company, Ltd
OECD, Organisation for Economic Cooperation and Development
SPRU, Science Policy Research Unit (at University of Sussex, Brighton England)
TNC, transnational corporation
TTC, Technology Transfer Centre
TVLC, Takoradi Veneer and Lumber Company
UAC, United African Company, Ltd
USD, United States dollar
WDC, Workers' Defense Committee

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